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AN INVESTIGATION INTO THE RELATIONSHIP OF THE PAUSING PHENOMENA IN ORAL READING AND READING COMPREHENSION

by

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A THESIS

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ABSTRACT

This study was an attempt to investigate whether the misuse of the pause in oral reading (by the disruption of a linguistic unit) was related to the reading comprehension ability of 72 Grade two and three children.

Although the pausing phenomena may be considered as one product of the reading act, in this study it was considered to be an overt manifestation of how children might be organizing or "processing" visual input while reading silently. The investigator also examined the data in relation to the oral reading comprehension scores of the test sample.

A linguistic algorithm was used to determine the syntactic constituents (which were the linguistic units on which the pause measurements were based), in the Gilmore Oral Reading Test, Form C, the oral reading text read by the children. Pauses were measured by processing the audio recordings of the children's reading through an Esterline Angus Speedservo labgraph, which produced a permanent visual graph on a strip chart. Pauses were displayed as time intervals, in milliseconds, along the baseline of this chart. Thus an objective and repeatable measurement of the pause was available to the investigator.

Data analyses consisted of three-way Analyses of Variance on the pausing variables, memory span scores, and intelligence quotients. Correlation coefficients were also calculated on 14 variables. Data were analyzed using both control and elimination of all pausing measurements due to lack of word recognition ability, and in addition, further analyses were

completed which included all the pausing measurements, even those due to lack of word recognition skills.

The results of the study revealed that the pausing phenomena in oral reading were consistently and significantly able to discriminate between the three silent reading ability groups. In addition, all the children in the test sample, tended to resist a disruption of the syntactic constituent, but those who paused less frequently and for shorter periods of time within syntactic constituents were always those children who scored higher on the silent reading comprehension tests.

While the "processes" of silent and oral reading seemed to be similar - as indicated by the ability of the pausing phenomena in oral reading to differentiate between silent reading groups, the "products" (or comprehension) of silent and oral reading, did not appear to be related. Further, those children who were the better silent readers seemed to be impeded by the necessity of reading orally. For the younger and less proficient readers, however, oral reading appeared to assist comprehension.

Intelligence and visual memory span showed some relationship to two of the pausing variables, but correlations, although statistically significant, were not high.

The data have provided some additional insights into the reading processes used by young children learning to read, and have raised some interesting speculations in this area of research.

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THE PROBLEM

I. BACKGROUND OF THE PROBLEM

The child learning to read and trying to reconstruct the message he is reading so that it agrees with the writer's intended message, is using a set of processes entailing a very complex performance, often not appreciated by the skilled adult reader.

To read, one must start with graphic material as input and end with the meaning as output. Between the input and output is a vast area involving an interaction between language and thought, which has interested psychologists, linguists, psycholinguists and educators for many years.

The study of linguistic units in spoken and written language has led to investigations of what cues exist in the speech stream or in the orthographic string to assist the listener or reader in processing a message. One of cues isolated by these investigations, and with which this present study is concerned, is the use of pauses as a behavioral manifestation of the comprehension of language.

Facility with the use of the pause in oral language does not necessarily imply a similar facility in written language. A problem which frequently becomes apparent in a

child's oral reading is incorrect use of the pause. If the child's oral reading is indicative of his silent reading habits, comprehension could well be affected by his inaccurate use of pauses. The following example leaves little doubt that comprehension would be difficult, if not impossible, for the child, who, while reading, pauses between the words marked off by slashes:

> Each day/Bob had a chore to do He rode his pony/ to bring in/cows One day/a horsefly lit on/Star's nose He began to snort and run/

The child, reading in this manner, fails to realize that the pauses he uses so naturally in speech also occur in written language. In the above example, a knowledge of punctuation marks would have been very beneficial. However, punctuation marks, in many instances, do not indicate word groups that belong together. A child might read:

> The little/boy came round/the corner

There are no cues in the surface structure to indicate how the words should be grouped, or where pauses, if any, should occur in order to facilitate comprehension.

The mature reader can grasp intuitively the global whole of the meaning, and although special words are interpreted, they are always interpreted under supervision of the whole, so that "feed-backs" and "feed-aheads" can work. In this reverting and anticipating process, it is necessary to "hold up" full actual determination of meaning. For

example, in the sentence "Your table three is not complete." If "table" is interpreted as an article of furniture, the next word "three" makes it clear that such an interpretation is incorrect. Feedback from the word "three" to "table", and feed-ahead from "table" to "three" revises the interpretation. Flexibility with written language processing makes this possible, and this "holding up" function has to work continuously when a child is reading. This is the same function that is needed in grouping words for rhythm and correct pauses.

It seems feasible to suppose that difficulty in understanding sentences may often occur because of lack of proper grouping. This grouping may be accomplished by a pause, either implicit or actual. For example, in the sentence "Those subjects with high affiliation need selected more people-pictures than those low in need," if one pauses after "affiliation", the understanding is lost.

Since the beginning of this century, both linguists and educators have indicated certain elements which are necessary in the oral reading of texts if comprehension is to be assured. One of these elements emphasized by many writers is the importance of grouping words into meaning-bearing patterns in order to comprehend (Gray, 1929; Daw, 1938; Gibbons, 1941; Nelson, 1947; McKee, 1948;

Kovas, 1957; Artly, 1957; Lloyd, 1962; Lefevre, 1962; Fries, 1965; Lerner, 1968. Yet not one of these writers presented any empirical evidence in support of the contention.

There has been no paucity of research and empirical studies into the nature of oral reading errors made by children, but the investigators have tended to ignore completely, or skirt superficially, errors that are related to proper word-grouping and to pauses.

Staiger (1955) and McCracken (1961) categorized a lack of response to punctuation cues as errors in oral reading. Staiger concluded that word-errors were adequate measures of reading errors, and McCracken stated that oral reading errors were not discriminatory of good and poor readers in his study.

Levin and Turner (1969) in their studies of eye-voice span in oral reading, noted that older readers and faster readers read to phrase boundaries, whereas the younger children, and slower readers, did not.

Inadequate phrasing, incorrect phrasing, and a short eye-voice span were recognized by Barbe (1958) in his study of oral reading errors made by 80 clients at a Reading Clinic.

Goodman (1965) noted regressions to correct intonation and rephrasing to change intonation, but did not analyze the errors further. Becker (1970) and Shandling (1970) both used Goodman's Taxonomy to categorize errors in oral reading,

but did not attempt to use the Intonation Category.

The past two years have witnessed the first attempts to gather empirical evidence in this important, but relatively unknown area of reading comprehension. These studies will be reviewed in Chapter Two.

II. STATEMENT OF THE PROBLEM

The problem then, is to investigate the efficiency of one of the reading processes that young children use, by attempting to investigate how the child organizes the visual input of the reading text (as manifested by his use of the pause), and to relate this to how well he comprehends what he has read. In general, this study is an attempt to determine the nature of the pausing phenomena in oral reading, and whether it is a possible overt feature of the verbal processing entailed in reading orally, and also in reading silently. In this study, the visual input, or orthographic string, is not organized for the child. It is assumed that how the child uses the pause in his oral reading will indicate how he is organizing the visual input. By investigating the number, length and placement of pauses as the child uses these devices in oral reading, it is hoped that cues will be obtained to indicate whether the child is organizing the reading material into meaning-

ful word groupings, or whether by pausing within such groups, he is disrupting the linguistic and cognitive unit. An attempt will be made to determine whether the three ability groups in silent reading comprehension (Above-average, Average and Below-average silent readers) differ significantly in how they use the pause when reading orally.

A further endeavour of this investigation will be to determine whether the pause phenomena in the oral reading of children has any relationship to some of the usually accepted theories of reading processes, especially in relation to comprehension, word recognition, memory-span and intelligence.

The unique feature of this study is that the method by which the pausing phenomena is measured is a completely objective and repeatable procedure.

III. PURPOSE OF THE STUDY

The purpose of the study is to investigate the relationship between pauses made by children reading orally, and their reading comprehension ability, both silent and oral.

In particular, it will:

1. determine whether the use, or rather misuse of the pause (by disrupting a linguistic unit) is related

to silent reading comprehension groups, and oral reading comprehension scores.

2. test the assumption (to be stated in this Chapter, and supported in Chapter Two), that young children learning to read, use oral reading processes that are similar to those they use when reading silently.
3. investigate the relationship between reading comprehension scores and various pausing phenomena: the percentage of time spent pausing while reading orally, the number of pauses made within syntactic constituents (to be defined), the percentage of time occupied by such pauses, and the average length of pauses within syntactic constituents.
4. determine whether auditory memory span, visual memory span, and intelligence are related to any of the pausing variables being investigated, and to silent and oral reading comprehension scores.
5. examine the relationship between the pausing phenomena used by children while reading orally,and their grade level and sex.

IV. DEFINITION OF TERMS

Oral Reading: is the spoken rendition of written language.

Pause: in this study, the term "pause" refers to the interruption or termination of the voice stream in

oral reading. It is measured by an Esterline Angus Speed Servo machine, in milliseconds.

Criterion Pause: since pause duration shows marked variability across oral readers, a "criterion pause" was established for each subject in the study. This was accomplished by calculating the mean length of the between-word pauses produced by subjects in their oral reading of a set of syntactic constituents (defined below).

Significant Pause: a significant pause exceeds the duration of an individual's "criterion pause" by a critical amount. This critical interval has been precisely determined by means of pilot work. For purposes of this study, a significant pause was 2.5 times longer than the criterion pause.

Syntactic Constituent: this refers to the lowest major constituent as defined by Latham (1972). It may be formed from all labelled nodes in a surface structure tree. These constituents are found by locating those nodes which are immediately above the lexical nodes and deciding whether or not there are sister-nodes to the lexical nodes. If there are no sister-nodes to a specific lexical node, then the node immediately dominating that lexical node is a lowest major constituent. If there are sister-nodes to a specific lexical node, then the lowest major constituent

associated with that node is the node which immediately dominates all sisters of the lexical node in question.

Average Readers: were determined by standard scores, as measured by the comprehension subtests of the *Gates-MacGinitie Silent Reading Tests*. Average readers in Grade two were selected from those children scoring between 56 and 58, while Average readers in Grade three were selected from those children scoring between 55 and 57. The explanation of why these ranges of scores were chosen to represent Average readers is given in Chapter III.

Above-average Readers: were determined by a standard score of 1.2 standard deviations above the mean for each grade, as measured by the comprehension subtests of the *Gates-MacGinitie Silent Reading Tests*.

Below-average Readers: were determined by a standard score of 1.2 standard deviations below the mean for each grade, as measured by the comprehension subtests of the *Gates-MacGinitie Silent Reading Tests*.

Word Recognition: refers to the ability of the child to look at a word and to pronounce it aloud correctly, as determined by the judgment of the investigator.

Control for Word Recognition: when a child, reading orally, hesitates for longer than two seconds before a word, or pauses for a longer period than his "significant pause" before a word that he is later unable to

identify on the Word Recognition Test, or when, after a pause of five seconds, the examiner has to prompt him on the word during the oral reading of the text, then the length of such a pause is not counted in its totality, but the length of the child's "significant pause" is assigned to the measurement. (Hesitations and prompts are considered as accuracy errors on the Gilmore Oral Reading Test, Form C).

Because the following terms are used by many people interchangeably, it was felt necessary in this study to define them explicitly:

Code: is a system of arbitrary symbols and combination of symbols, by means of which communication is conveyed. For the purposes of this study, the codes identified are the orthographic and the auditory. The auditory code is characterized by two aspects: the expressive (oral code), and the receptive (aural code).

Recode: is used to mean going from code to code, i. e. aural to graphic.

Decode: is synonymous with comprehension.

Encode: refers to the process of going from meaning to any code or aspect of a code - orthographic, aural, or oral.

V. HYPOTHESES

The null hypotheses tested by this investigation were as follows:

1.10 That Average readers, Above-average readers and Below-average readers do not differ significantly in the percentage of total reading time spent in pausing while reading orally the complete test,

- 1.11 when the effect of inadequate word recognition ability is controlled;
- 1.12 when the effect of inadequate word recognition ability is eliminated from the data;
- 1.13 when the effect of inadequate word recognition ability is included in the data.

1.20 That Average readers, Above-average readers and Below-average readers do not differ significantly in the percentage of total reading time spent in pausing while reading orally the first 70 syntactic constituents of the test (which was the oral reading material read in common by all subjects),

- 1.21 when the effect of inadequate word recognition ability is controlled;
- 1.22 when the effect of inadequate word recognition ability is eliminated from the data;
- 1.23 when the effect of inadequate word recognition ability is included in the data.

2.10 That Average readers, Above-average readers and Below-

average readers do not differ significantly in the period of time spent pausing within syntactic constituents while reading orally the complete test,

2.11 when the effect of inadequate word recognition ability is controlled;

2.12 when the effect of inadequate word recognition ability is eliminated from the data;

2.13 when the effect of inadequate word recognition ability is included in the data.

2.20 That Average readers, Above-average readers and Below-average readers do not differ significantly in the period of time spent pausing within syntactic constituents while reading orally the first 70 syntactic constituents of the test,

2.21 when the effect of inadequate word recognition ability is controlled;

2.22 when the effect of inadequate word recognition ability is eliminated from the data;

2.23 when the effect of inadequate word recognition ability is included in the data.

3.10 That Average readers, Above-average readers and Below-average readers do not differ significantly in the number of pauses made within syntactic constituents while reading orally the complete test,

3.11 when the effect of inadequate word recognition ability is eliminated from the data;

3.12 when the effect of inadequate word recognition ability is included in the data.

3.20 That Average readers, Above-average readers and Below-average readers do not differ significantly in the number of pauses made within syntactic constituents while reading orally the first 70 syntactic constituents of the test,

3.21 when the effect of inadequate word recognition ability is eliminated from the data;

3.22 when the effect of inadequate word recognition ability is included in the data.

4.10 That Average readers, Above-average readers and Below-average readers do not differ significantly in the average length of pause made within syntactic constituent while reading orally the complete test,

4.11 when the effect of inadequate word recognition ability is controlled;

4.12 when the effect of inadequate word recognition ability is eliminated from the data;

4.13 when the effect of inadequate word recognition ability is included in the data.

4.20 That Average readers, Above-average readers and Below-average readers do not differ significantly in the average length of pause made within syntactic constituent while reading orally the first 70 syntactic constituents of the test,

4.21 when the effect of inadequate word recognition ability is controlled;

4.22 when the effect of inadequate word recognition ability is eliminated from the data;

4.23 when the effect of inadequate word recognition ability is included in the data.

5.10 That there is no significant relationship between the percentage of pause time used by children reading orally the complete test, and their oral reading comprehension scores.

5.20 That there is no significant relationship between the percentage of pause time used by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

6.10 That there is no significant relationship between the period of time spent pausing within syntactic constituents by children reading orally the complete test, and their oral reading comprehension scores.

6.20 That there is no significant relationship between the period of time spent pausing within syntactic constituents by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

7.10 That there is no significant relationship between the number of pauses made within syntactic constituents by children reading orally the complete test, and their oral reading comprehension scores.

7.20 That there is no significant relationship between the number of pauses made within syntactic constituents by

children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

8.10 That there is no significant relationship between the average length of pause within syntactic constituent made by children reading orally the complete test, and their oral reading comprehension scores.

8.20 That there is no significant relationship between the average length of pause within syntactic constituent made by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

9.10 That when the complete oral reading test is considered, there is no significant relationship between (1) the percentage of total reading time spent in pausing, (2) the period of time spent in pausing within syntactic constituents, (3) the number of pauses made within syntactic constituents, (4) the average length of pause within syntactic constituent, and

9.11 Auditory Memory Span for Digits Forward,

9.12 Auditory Memory Span for Digits Backward,

9.13 Visual Memory Span for Letters, and

9.14 Intelligence Quotients.

9.20 That when the first 70 syntactic constituents of the

oral reading test are considered, there is no significant relationship between (1) the percentage of total reading time spent in pausing, (2) the period of time spent in pausing within syntactic constituents, (3) the number of pauses made within syntactic constituents, (4) the average length of pause within syntactic constituent, and

9.21 Auditory Memory Span for Digits Forward,

9.22 Auditory Memory Span for Digits Backward,

9.23 Visual Memory Span for Letters, and

9.24 Intelligence Quotients.

10.00 That there is no significant main effect due to silent reading group, grade, or sex, on

10.10 Auditory Memory Span for Digits Forward,

10.20 Auditory Memory Span for Digits Backward,

10.30 Visual Memory Span for Letters, and

10.40 Intelligence Quotients.

11.00 That there is no significant main effect due to oral reading group, grade, or sex, on

11.10 Auditory Memory Span for Digits Forward,

11.20 Auditory Memory Span for Digits Backward,

11.30 Visual Memory Span for Letters, and

11.40 Intelligence Quotients.

VI. ASSUMPTIONS

Four assumptions on which this investigation is based are:

1. That, although the reading act is a very complex activity, some distinction can be made between "process" and "product" in the study of reading comprehension.
2. That the pausing phenomena used by young children while reading orally, although measured as an output, is assumed to be indicative of one aspect of the reading process - that is, how children are organizing or grouping the visual input.
3. That the oral reading processes used by children in Grades two and three are similar to their silent reading processes (Pival, 1971; Goodman, 1968; McCracken, 1967).
4. That a syntactic constituent, as defined in this study, is a functional linguistic and cognitive unit in the perception of written language.

VII. LIMITATIONS

Two limitations were recognized at the beginning of this study. They were:

1. The difference between the way comprehension was tested in the two standardized reading tests used in the investigation - the silent reading test and the oral reading test.

   After reading the selection orally, the child could not again refer to the text, and he was also required to

verbalize his answer to the comprehension questions.

The silent reading test (although timed, which would limit re-scanning to a certain extent), provided an opportunity for the child to re-read the selection or parts of it before it was necessary to answer the comprehension questions, which did not have to be verbalized. On the silent reading test, the child indicated the correct answer to the comprehension question by marking with his pencil one choice from four alternatives.

These two quite different ways of testing reading comprehension were considered to be a limitation in this study, but since accepted and well-known standardized tests were preferable to the investigator, this limitation was tolerated.

2. Another limitation of the study was that the sample was chosen from Grades two and three levels only. An extension of the study down to include a sample of Grade one children would probably have provided much more information, especially on the silent and oral reading processes of young children.

However, at the time of year the data were collected, it was not possible to obtain a sample of Below-average Grade one readers who would meet the

specifications required. Grade one children scoring 1.2 standard deviations below the Grade one mean (see Chapter III for a description of how the sample was selected) were not able to read even one paragraph of the oral reading test. After the Pilot Study, therefore, it was decided that Grade one children could not be included in this investigation.

VIII. SIGNIFICANCE OF THE STUDY

The significance of this study is derived from the fact that educators for the past forty years have shown concern for the pausing phenomena, under the name "pause", and various other related labels: phrasing, intonation, rhythm, punctuation, and the relationship of these phenomena to reading comprehension.

However, no objective evidence can be found which attempts to investigate the pause phenomena in the oral reading of young children, and its possible relationship to the comprehension of written language.

This study is the first attempt to apply a physical measurement to the pause phenomena of young children reading orally, and to relate this to both their silent and oral reading comprehension abilities.

It is also hoped that the data analyzed in this investigation will provide further insights into the reading processes used by young children, and to determine whether in fact, the silent and oral reading processes of these young readers are indeed similar.

If this study can provide additional information on the reading processes used by young beginning readers (as reflected in their use of the pausing phenomena in oral reading), then it is anticipated that this knowledge can be implemented into practical suggestions and effective methodology related to the teaching of reading.

IX. OVERVIEW OF THE STUDY

This study required four basic decisions: 1) the decision of what time element would be constituted as a pause, and how this would be measured; 2) the decision to use the linguistic algorithm proposed by Latham (1972) as the means of determining at what points in the oral reading text a syntactic constituent would begin and end; 3) to decide what tests and instruments would be used in the study, and to verify or establish the reliability and validity of each; and 4) the decision of what research design would best fit the proposed data.

In writing the results of this investigation, the related literature and theoretical framework within which the study was designed is sketched in Chapter II. The design of the study is explained in Chapter III. In Chapters IV, V, and VI the findings of the study are analyzed. The final chapter contains a summary of the findings, the conclusions drawn from the investigation, and the implication of these findings for amplifying reading theory, provoking further research, and improving the teaching of reading.

CHAPTER II

RELATED LITERATURE AND THEORETICAL FRAMEWORK

I. INTRODUCTION

Pause is a form of language disjunction, and regardless of why the pause occurs, it represents an interruption in the flow of language. A group of elements separated by pauses would, then, tend to have a cohesiveness. The relationship between the words of a constituent group would seem to be stronger than that between groups. In this respect, pauses are related to content, and function not only linguistically, but also psycholinguistically (VanUden, 1970, p. 47). Osgood (1954) suggests the pause as the possible unit boundary of language. Starkweather (1959) and Hargreaves (1960) have also assumed, without testing, that the pause is a valid unit boundary of language.

Since the major goal of reading a sentence is comprehension, it seems reasonable to suppose that the perceptual and cognitive processing of that sentence would be facilitated if the units stored for processing corresponded to the major sense groupings in that sentence. There seems to be no doubt that material is far more easily handled when it has phrase-structure than when it has none (Neisser, 1967, p. 274),

and when it has intonation or rhythmic pattern than when it has none (p. 223). However, the cognitive processes accompanying this phenomenon are still not well understood, nor is there as yet agreement on the matter among linguists and psychologists. It seems clear, however, that pausing as a language form, can make more prominent the perceptual and/or cognitive unit of the language (VanUden, 1970, p. 47).

Neisser (1967, p. 232) states that the entire structural principle of the organization of language into linguistic units is based on rhythm. The rhythm of language is structured in advance, either by the speaker or the writer. The meaning of a sentence depends on this structure, which supports the syntax, and also the cognitive content. In spoken language, this rhythm is called "intonation". In the process of learning to read, this very important aspect of the language, has to be supplied by the child. A child learning to read, not only has to interpret the graphic symbols and the syntactic structure of the written language, but also, for the first time in his linguistic experience, is exposed to the syntactic structure of the language from which the prosodic structure is absent.

This young child has to try to reconstruct the message he is reading so that it agrees with the writer's intended message. To "read" then, he must start with the graphic material as input and end with the meaning as output.

Between the input and output is a vast area involving an interaction between thought and language.

Psychologists, linguists, psycholinguists, and educators have all been interested in, and contributed to, understanding this interaction of language and thought which occurs between input and output during reading.

Research which has contributed to a better understanding of this interaction has been concerned with the production of oral language, the processing of oral language, and the processing of written language (which entails the reading processes being employed by the reader). The present study is concerned with the use of the pause as a behavioral manifestation of how the reader may be using the surface structure relationships to comprehend the message. In this Chapter, an attempt will be made to review some of the relevant studies in the areas mentioned above, and to formulate a theory from which the present investigation can depart.

II. PROCESSING AURAL LANGUAGE

Perceptual Units and Aural Language

Because of the limitation of the short-term memory, it seems reasonable to suppose that the information contained in oral language, or a phonetic string, must be grouped

aurally into perceptual segmentation units by the listener in order to enable him to decode the message.

Various theories of speech perception have attempted to identify these perceptual units. None of these theories have been proven to be completely incorrect, nor have any been accepted as accurate in all respects. What has been proposed is that the processing of speech is a little understood process, and an adequate explanation will require much more thorough investigation of human cognitive abilities, as well as more knowledge of the nature of language itself (Bond, 1971).

The theories of speech perception that have attempted to identify the units of perception of spoken language will be mentioned only briefly as it is not at all impossible that units of perception in spoken language are not the same as those in written language, and it is primarily with written language that this study is concerned.

The Motor Theory of Speech Perception, and the Analysis-by-Synthesis Theory, are quite similar. Both propose that the listener generates a possible phonetic output which is matched against the incoming stimuli. These theories, formulated by Cooper, Liberman, Shankweiller, Studdert-Kennedy (1967), and Stevens and Halle (1965) propose phoneme-by-phoneme clusters of discrete segments as

the perceptual unit.

The Filtering Theories proposed by Licklider (1952) and Wickelgren (1969) suggest that all the information in the stimuli is not discriminated, but only that which is necessary for comprehension. These theories also indicate phoneme-by-phoneme clustering as the perceptual unit.

The word is the basic perceptual unit in Osgood's perceptual model (1963), in which words are coded by processing a simultaneous bundle of semantic features.

During the past seven years, a theory of perceptual strategies has been developed, based on Chomsky's transformational grammar (Garrett, Fodor, Bever, 1965, 1966). These linguists attempted to discover the perceptual strategies used by listeners, and to integrate these strategies with perceptual and cognitive processes. Perceptual strategies, to these linguists, meant the techniques used by the listener to segment a sentence into cognitive units, and which enabled him to assign the proper grammatical function to each unit. First statements of the theory were based on experiments with click localization. Subjects were presented with a sentence having a click superimposed on it. Points between two clauses or between two phrases were considered by Garrett, Fodor and Bever, to be constituent boundaries. Subjects always tended to locate the click toward the nearest constituent boundary

rather than at the actual objective location of the click. In addition, clicks located at constituent boundaries tended to be localized correctly. Garrett, Bever and Fodor interpreted this to mean that surface structure constituents form perceptual units which tend to resist interruption.

Many linguists and psychologists have tried to show evidence of perceptual units of oral language. Martinet (1962) posits that if one insists on an auditory unit of intermediate size, then it is an "independent phrase". Although Martinet provides an example, i.e. "down the road", he does not define what he means by independent phrase. Both Miller (1962) and Suci (1963) believe the phrase (which they also did not define), to be the natural perceptual unit of processing. They based their decision on the fact that speech units can only be processed at about one per second, and that a phrase is probably all that the short-term memory can accommodate.

Bond (1971) distinguishes between perception and analysis of auditory stimuli. She believes that initial segmentation is accomplished by use of the suprasegmental structure of the utterance, but is willing to concede that, after the initial segmentation, the perceptual strategy proposed by Garrett, Bever and Fodor may be the means by which the listener analyzes the utterance syntactically. She is supported in her view by Lehiste (1971, p. 77) and

Ebeling (1960), who believe that intonation is the first cue to segmentation.

Certainly all linguists and psychologists agree that there are units of speech perception. However, what these units actually are has been the object of much research and many diverse opinions. Also, except in the case of Bond (1971), there is no clear distinction between perception and analysis (the initial segmentation of the utterance and the actual relationship of the various parts to one another in order to determine their meaning). Most research has not made clear whether these are considered as one or two distinct processes.

In addition, all these studies were done with adults, usually university students, and the size of the sample, was in most cases, extremely small. Brain (1963), who worked with children in trying to determine their ability to learn language, believes that intonation defines the borders of the perceptual units for young children (p. 348). His sample consisted of twelve children, and the language he used was a simple, artificial one which he composed for the experiment.

When a small child reads aloud material that he has not had occasion to read silently first, it is presumed that the aural feedback must be organized by him into a kind of cognitive unit, so that he is able to comprehend what he

is reading. This unit may be very similar to the unit used in the perception of oral language, and hence a survey of these perceptual theories has been reviewed in this section.

Memory and Aural Language

Research has shown that to facilitate storage of information in either the short-term or long-term memory requires a code, and that certain codes are easier than others (Dale, 1964; Peterson & Peterson, 1959; Wickelgren, 1965, 1969). The amount of information that can get into short-term memory, depends on its form. Short-term memory can only contain at the most, seven to nine elements at any one time, whether these elements be letters, words or meanings extracted from several words (Miller, 1956). Smith (1971) believes that the actual elements would be more likely to number four or five (p. 88). However, by grouping the elements, or the amount of information perceived, the load on short-term memory can be reduced (Miller, 1956; Ryan, 1969; Neisser, 1969). By grouping the individual stimulus into a pattern, or string, the subject then creates a cognitive unit. If information is properly grouped, then, one can remember much more than four or five, or seven individual stimuli. If the stimulus is a string of words, grouping these words in relation to the

syntactic or semantic structure of the language increases the number of elements that can be held in short-term memory.

Rhythm, when superimposed on a string of words, facilitates the storage of these words in the short-term memory which otherwise would not exist,and hence plays a large role in short-term memory (Neisser, 1967, p. 223). Since rhythmic structure is so important to short-term memory capacity, and since rhythm is closely related to grouping of words and to phrase structure in language, then phrase structure and pauses (the timing cues in rhythm) must also play a significant role in memory. Aural information, with a surface structure setting apart phrases indicated by pauses, should be easier to remember.

Epstein (1961, 1962) has shown that nonsense syllables, given phrase structure and/or sentence frames are much easier to learn than the same items exposed one by one on a memory drum. However, what Epstein means by "phrase structure" is not well defined.

An experiment by Miller and Isard (1963) showed that grammatical strings are easier to recall than non-grammatical strings of words. However, when intonation was suppressed from the grammatical strings, the superiority of grammatical strings was greatly reduced.

O'Connell, Turner and Onuska (1968) controlled for intonation in their experiments in the learning of grammatical and non-grammatical material. They found that only when intonation was present were the grammatical structures easier to remember than the non-grammatical.

Pauses and Aural Language

Pauses are related to the total rhythmic structure of a sentence (VanUden, 1970, p. 47). In addition, the entire structural principle of the organization of language into linguistic units is based on rhythm (Neisser, 1967, p. 232).

Suci (1967) found that phrases surrounded by pauses were memorized better than phrases not surrounded by pauses. He carried out four experiments with university students, to assess the validity of pause in speech as an index of unit boundaries in language. Sixteen subjects were divided into two groups. The subjects in one group learned an original story, a phrase version of a second story, and a pause version of the original story. The other group learned the original story, a non-phrase version of a second story, and a non-pause version of the original story. The second story, containing phrases or non-phrases, was inserted in an attempt to control for the fact that the ease with which pause-bound material was learned might be an index of phrase-organization rather than pause-bound units.

This he called "syntax condition". All his tasks were learning and recall types, and stories were presented to all subjects by means of a tape recorder. Each of the two groups learned a different original story, but the syntax conditions and the experimental conditions were counter-balanced within each of the two groups. Results of the data analysis support Suci's hypothesis that language is organized into units, and that these units are segregated by pauses. In addition, a comparison of the syntax condition with the pause condition, revealed that phrases are easier to learn than non-phrases, but that it is even easier to learn the pause material than non-pause material. Suci concluded that the pause was a stronger unit of organization than the phrase.

Ryan (1969) in her investigation of grouping strategies and short-term memory, using digits, reports findings that seem to lend support to Suci's conclusion that the pause is a powerful unit of organization. In addition to a non-grouped presentation of items, various methods of inducing grouping were employed - temporal (experimentally imposed pauses), non-temporal (by the introduction of brief pips at designated places), internal (by instructions to the subjects on how to group), and lastly, a combination of both the pips and the instructions. Only the temporal method, of inducing grouping by placement of pauses, produced signifi-

cant retrieval results.

III. PROCESSING OF WRITTEN LANGUAGE

Although there is a relationship between the oral and written systems of language, certainly there is a difference between the visual and auditory processing of it. Written language is not simply spoken language in graphic form, or speech written down. There is, then, a difference in syntax between the two forms. In addition, oral language contains both the syntactic structure and prosodic structure, whereas written language lacks the prosodic structure. There is also a difference in the control over the rate at which each can be processed by the receptor. Because written language tends to be more economical than oral (in the avoidance of false starts, repetitions, etc.) the information-load per unit, carried by written language tends to be higher than that carried by aural language.

Perceptual Units and Written Language

As early as 1889, Cattell believed that reading units could be words, phrases or even sentences, because he found that his subjects could recognize words, phrases and even short sentences, presented by tachistoscope as easily as they could individual letters.

Buswell (1920), in studying eye-voice span, concluded

that eye-voice span allowed the mind to grasp a large meaning unit before the voice expressed it. He hypothesized that the eye-voice span takes in units of meaning similar to phrases or sentences. Although his evidence showed that the units were larger than individual letters, he could not present evidence to show that they were in fact larger units, such as phrases.

These two early experiments provide evidence that the units of written language may be individual letters, phrases, sentences, or even larger meaning units.

Fifty years later Goodman (1970) stated that the perceptual, syntactic and semantic information used in the reading process are used simultaneously and not sequentially (p. 15). In speaking of perceptual linguistic units in written language, then, it is impossible to separate these three types of information.

Psychologists have been aware for some time that the perceptual process in reading is much more complex than the identification of letters and word shapes in succession, on a printed page. The skilled reader can process the written language at a rate far greater than aural language, reading 600 words per minute or more. It is clear, then, since these rates exceed the capacity of the visual perception and short-term memory systems, that the adult is not visually perceiving every letter and every phoneme, and every word.

The skilled, mature reader is processing large meaningful units of written language. He is aided in this by his knowledge of the syntax of the language, and his efficient coding strategies. In addition, he is not hindered by the rate of a speaker's production as he is when he is processing aural language. As a consequence, the skilled reader is able to identify and predict information at a considerably faster speed than he would if he were processing aural language.

The young child too, brings to reading his knowledge of the oral language. However, the visual representations involved in reading, unlike the auditory perceptual units, are already grouped for him physically into units called "words". These words are much more obvious in graphic print than they are in aural language, as many teachers realize when a child asks them how to spell "guzinto" (goes into). The written word is clearly and neatly marked off from those around it by a white space. Many teachers tend to concentrate on words: controlled vocabulary, sight vocabulary, word-attack skills, word flash-cards. It seems as if the knowledge of aural language which the child has already mastered to a considerable degree, is now a hindrance to him, rather than the help that it should be.

Weber (1970) presents some evidence of this. In her

analysis of first grade oral reading errors, she found that 65 per cent of the errors children made in reading were grammatically correct, and 68 per cent of the errors were semantically appropriate, in terms of the entire sentence. However, as the child began to acquire more school-learned word recognition skills of sound-letter correspondence, this grammatical and semantic acceptability of the errors decreased. The child tended to concentrate on the grapheme-phoneme correspondence in the word, rather than on the meaning of the passage.

Biemiller (1969) in his study of first grade children, reading orally, also found that in the beginning stages of learning to read, the children relied heavily on syntax, but that only the good readers progressed past this stage and were able to use grapheme-phoneme correspondence cues as well as context clues. Biemiller felt that the beginning reader, if he was to progress past the use of his aural language syntax clues, which resulted in "guessing" should be discouraged from using the syntax, until he had mastered sound-letter correspondence. After the sound-letter correspondence has been learned, then only should he be encouraged to use syntax.

The findings of these two studies seem to imply that although the knowledge of some grapheme-phoneme correspondence may be necessary in learning to read, too much emphasis on

this aspect of decoding tends to detract from comprehension.

Although Biemiller tends to depreciate "guessing", Goodman insists that reading is actually a sampling, predicting and guessing process (Goodman, 1970, p. 15). In this process, although grapho-phonic information plays some part, nevertheless, the syntactic and semantic information is a very necessary and important component. If not, the child is "word calling", not "reading".

It seems a great loss that the child's knowledge of his language cannot be used more effectively in teaching him the transfer from oral to written language. As Weber (1968) states in her summary of reading research: "In all of reading research, the interest shown in words as visual displays stands in contrast to the neglect of written words as linguistic units represented graphically (p. 563)."

Several studies have attempted to investigate the nature of the linguistic unit used by skilled and unskilled readers:

North and Jenkins (1951), in their study with 180 university freshmen, found that segmentation of sentences into units of meaning, facilitated reading speed and comprehension.

In his research, also with college students, Kolers (1970) related evidence to support the view that the subjects were not reading word by word, but were using their knowledge

of the grammatical relationships within sentences. Goodman (1967) believes that an essential reading strategy is the recognition of phrases and larger sequences.

Cromer (1970) investigated good and poor readers at college freshman and sophomore levels. His results indicate that one cause of comprehension difficulty was the way in which some poor readers organize visual input of the material. Comprehension for poor readers was significantly improved by organizing the reading material into meaningful word groupings of noun and verb groups, clusters, clauses and short sentences.

Eye-voice span is mentioned by Smith (1971) as a proof that written language is processed in meaningful units. He contends that the eye-voice span of a skilled reader is about four or five words (or about the same capacity of the short-term memory), and that it is not just any four or five consecutive words, but extends to phrase boundaries. To demonstrate this phenomenon, he suggests that while a person is reading aloud, the light be suddenly switched off, and notice taken of how many words the reader can continue to utter. If the phrase the reader is reading ends three words after the lights go out, he will probably only recite these three words. However, if the phrase extends to six words, he can probably utter the entire six

words. Smith concludes that eye-voice span is not determined by number of words, but by the phrase structure of the passage.

Memory and Written Language

To process the elements of a sentence in short-term memory and to understand the sentence, while reading, one must remember a good deal about the beginning when one has reached the end. The results of many recent experiments in short-term memory have reported an auditory confusion, even when the stimuli were presented visually. Conrad (1962) found that substitution errors tended to involve units that sounded alike. Although he worked with letters only, his subjects seemed to be processing the visual stimuli into auditory representations, and subsequently confused one with another when required to repeat them. Sperling (1960, 1963) and Wickelgren (1965) both presented stimuli visually, and subjects confused them auditorily when they wrote them down or repeated them. This phenomenon was particularly noticeable when the visual stimuli "sounded" alike, or had a phoneme in common. Results of these experiments were interpreted to indicate strongly that the short-term memory functions very much as an auditory information processing system. Neisser (1967) goes so far as to state that "such findings leave no doubt that the information is

preserved in a medium which is as auditory as language itself (p. 224)."

Researchers of memory in psychology have tended to concentrate on auditory short-term memory,or on long-term memory. However, it seems that visual memory span plays an important role in the reading process, especially of young children, who tend to read each word on the page and hence have to remember what they are reading, whereas excellent or mature readers tend to read meaning directly from the visual input (Bever and Bower, 1970, p. 310).

As already stated in the preceding section, the amount of information the short-term memory can accommodate depends upon the grouping of the stimuli (Miller, 1956; Ryan, 1969; Smith, 1971). If then, the visual information is grouped into meaningful units, or structural units, it would apparently be easier to remember.

Pauses and Written Language

In this present study, although the child is not exposed to a text in which the visual input has been organized for him, nevertheless, the pauses the child makes within syntactic constituents are determined by means of such a procedure - that is, the examiner's copy of the oral reading text has been organized into visual units,(as explained in Chapter III).

Research has shown that grouping effects take on special importance when written language is concerned, especially when the grouping technique used is the pause. The data from the 1968 study by Wilkes and Kennedy which were obtained by using sentences meeting certain syntactic rules, and the data from a 1970 study by the same investigators, using lists of words within pause-defined groups, reveal that although the retrieval processes employed by adults, using sentences and using lists, apparently share similar features, the data are sufficiently different to suggest that certain critical features present in grammatical material are missing when lists are used (Wilkes and Kennedy, 1970, p. 201).

Wilkes and Kennedy conclude that, when sentences are being read, the reader is likely to place pauses at grammatical boundaries, since syntax and the placing of pauses are closely related (1970, p. 197).

Data to support this same view have recently been presented by Martin, Kolodziez and Genay (1971). One hundred six university students were instructed to read forty sentences several times until they had achieved an "ideal" performance - that is, were able to read them without error and with correct intonation. They were then required to indicate, by drawing perpendicular lines, the

positions where they perceived breaks in the intonation contour. The majority of pauses were at major constituent boundaries. The investigators argue that it is the intonation pattern applied to the surface structure that determines where the segmentations of written language occur.

Goldman-Eisler's (1968) extensive investigations on the pause phenomenon have included small portions on the role of the pause in relation to oral reading production, although most of her work has been done in relation to the pause in speech production, and the cognition of oral language. The readings, in her experiments, were produced by adults who were proficient and fluent oral readers (subjects were professional translators), but there is enough evidence to warrant the assumption that the pause is an important aspect in oral reading activity.

Data from these studies revealed that the grouping of words in reading orally was entirely in terms of the sentence and clause structure of the passages - that is, pauses followed the rules of grammar. In spontaneous speech, 55 per cent of the pauses occurred at grammatical junctures, and 45 per cent at non-grammatical junctures. Pauses in reading, however, appeared to fit the grammatical structure exactly.

In the oral reading of prepared passages by adults, patterns of pause were indicative of what Goldman-Eisler called "cognitive rhythm", or the organization into patterns of alternating pauses and fluency. It was observed, that when reading involved cognitive activity, or comprehension, at least 30 per cent of the utterance time in reading orally entailed pauses. The investigator proposed that interpretation of the passage is facilitated by the pause-speech ratio. Since her subjects were fluent readers there was no attempt to relate pause-ratio with lack of comprehension.

In a linguistic experiment investigating the predictability of pause time in a professionally read message, Brown (1971) attempted to study language processing from the decoding point of view. He analyzed the reading performance of one adult subject from three points of view: 1) an information analysis of all lexical items in the context, 2) a surface structure, syntactic analysis, and 3) a deep structure analogue measure.

Results indicated that 64 per cent of the pause variance could be predicted from the syntactic measures. Brown concluded that, for fluent oral readers, syntactic analysis would appear to be a significant predictor of specific pause locations, which tend to be at grammatical junctures. However, the fact that Brown obtained the pause measurements used in his analyses from the oral reading performance of only one subject would greatly detract from the significance of his findings.

Pauses and Reading Achievement of Children

All of the studies mentioned above concerning the pause have consistently used adults as subjects. The past three years have witnessed the first attempts on the part of educators to gather empirical evidence in an area which they have deemed very important for many years.

Means (1969) studied the use of pitch, stress and terminal juncture (or pause) in oral reading. He investigated sixty, third-grade children in Huntington, West Virginia. The reading passage which was read to obtain error scores on pitch, stress and terminal juncture, was taken from the second book, third reader of the Winston Basic Readers. Only selected sections of the passage were analyzed, and were limited to those portions contained in quotation marks. This consisted of 52 running words. Errors were determined on the bases of incongruity of a particular speech behavior with the context. Marking of the tape recordings of the oral reading selections was totally subjective, and no hard and fast criteria were applicable (p. 29).

The results of data analyses (correlation coefficients) indicated statistically significant correlations between pitch, stress and terminal juncture, and reading comprehension scores.

The only other study that could be found was one on juncture, pitch and stress as reading behavior variables.

This investigation was conducted by Clay and Imlach (1971), with a sample of 103 seven-year olds in Auckland, New Zealand. Each child read from four standard selections taken from story books. The first story was easy, and the last sufficiently difficult for the best readers to show the full range of their skills. Accuracy was determined by number of words read correctly per minute. This was the criterion used to determine adequate and inadequate readers. No comprehension scores were obtained.

As in the other study mentioned above, these data were also analyzed subjectively. Juncture was defined as "a very brief pause, longer than the normal space between the sounds within a word." Two other categories of juncture were: "A slightly longer pause often represented in written language by a comma", and "the pause normally occurring in careful speech at the end of a sentence (p. 135)." Imlach analyzed all the tape recordings, and no statistical checks were made on the reliability of his categorizing.

Results of data analyses indicated that juncture or pausing was correlated with reading ability. However, since no measure of reading comprehension was obtained in this study, the results can only be related to reading accuracy, which is just another name for accurate word recognition. Word recognition is not synonomous with "reading".

IV. READING - SILENT AND ORAL

Reading, as described by Goodman, is a complex process by which a reader reconstructs, to some degree, a message encoded by a writer in graphic language (Goodman, 1970, p. 5). The total reading process is exceedingly complex, and comprises physiological, psychological, and linguistic variables. However, several areas related to the process can be identified. Among these are the aural and written language systems mentioned previously. Since the storage of items in short-term memory is a necessary component of these systems, the comprehension of written language will depend a great deal on how items are grouped or stored in the short-term memory. Research has indicated that the perceptual and cognitive processing of a sentence is facilitated if the units stored in the short-term memory correspond to the major sense groupings in the sentence (Miller, 1956; Smith, 1971). It seems then, that if the words of a syntactic constituent group were stored in the short-term memory as one unit, that comprehension would be facilitated. Pausing, as a language form, can serve to emphasize these groups (Starkweather, 1959; Hargreaves, 1960; VanUden, 1970). If, on the other hand, pausing occurs within the syntactic constituent group, it could be assumed that comprehension would be adversely affected.

Reading begins with the graphic input and ends with meaning as output. What happens between input and output has been hypothesized by many researchers, and is often called the reading "process". Since one cannot get inside a child's head to find out what is happening there, one way of attempting to investigate the reading process is to examine the output, or the "product". This product can be analyzed in two ways: 1) by examining the child's comprehension of what he has read, and 2) by analyzing the oral output in an oral reading performance.

In this study, the graphic input is the language patterns - words, phrases, sentences and passages of the silent and oral reading tests administered to the subjects. One aspect of the output is the child's response to the comprehension questions on these tests. In addition, however, it is assumed that the way in which the child uses the pause in his oral reading performance is also a part of the output. But the pause may also serve to indicate one aspect of the reading process - that is, how the child is organizing visual input while reading and how this organization may affect his comprehension. In this respect then, although the pause is measured as output in this study, it could also be indicative of input.

In the beginning stages of learning to read, oral and silent reading are probably quite comparable processes. McCracken (1967) indicates that children in grades one and

two read silently and orally at the same rates. He concludes that the reading process for these children is probably very similar whether they are reading silently or orally. Goodman supports this view also (Goodman, 1968, p. 18). In grades three and four, the children can read silently at a slightly faster rate, but not until grade six is there a pronounced difference in their rates of oral and silent reading. It would seem then, that not until sixth grade are the oral and silent reading processes of children quite distinct.

Silent Reading

Since the major output in reading should be comprehension or meaning, it is possible to gain many insights into the reading process itself, by examining the output of a silent reading performance - which is meaning or comprehension of the material read. Without comprehension of some kind, reading is not taking place. The more complete the comprehension, the more proficient is the reader.

A skilled reader may be so proficient that he can obtain meaning directly from the graphic input. A child learning to read, however, even when reading silently, first recodes the graphic input into internal speech and then, using his own speech as aural input, decodes for meaning as he does in listening (Goodman, 1970, p. 17).

Many experiments on inner speech in silent reading

were conducted by Edfeldt (1960), using electrodes to record muscle movement in the larynx. He states that "it remains perfectly clear that those pupils who are just learning to read exhibit more, or at any rate more obvious forms of, silent speech than do those persons who have received reading instruction for a longer period of time (p. 100)." Furthermore, this mediated process is not unique to young children. Many inefficient readers continue to process graphic input auditorily. At times, even skilled readers resort to a type of inner speech when passages are extremely difficult to comprehend (Edfeldt, 1960; Bever and Bower, 1970).

An adaptation of the Goodman model (1970, p. 17) suggests the following figure as a possible simplified model of silent reading in the early stages:

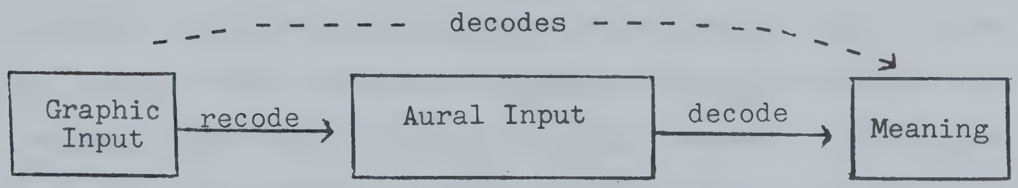


FIGURE 2.1

AN ADAPTATION OF GOODMAN'S 1970 MODEL
TO ILLUSTRATE EARLY SILENT READING

This model indicates that the child must first recode the graphic input to aural input, and then decode the meaning as he would aural language input in listening. Such a process puts an additional strain on the short-term memory of the child, and also on his ability to supply the suprasegmental features of stress, pitch and pause. However, Goodman assumes that even at the early stages of beginning reading there is some direct decoding from print to meaning, due to the sampling of syntactic and semantic information available in language. The research mentioned previously, by Biemiller (1969) and Weber (1970) supports this assumption that the child does seem to make use of his knowledge of the syntax and semantics of the language to assist him in comprehending what he is trying to read.

Research has shown that even in the silent reading processes of mature readers, there is often an auditory component (Peterson & Peterson, 1959; Edfeldt, 1960; Holmes & Singer, 1961; Katch & Deutsch, 1963; Smith, 1965). Bever and Bower (1970) distinguish between "visual" and "auditory" readers, even when referring to adult readers. They go so far as to say that the majority of readers use primarily the perceptual processes associated with the auditory perception of sentences. Excellent, or "visual" readers, on the other hand, analyze the visual input directly, independent of auditory processes (p. 310). These readers are able to

extract a linguistically correct and psychologically pertinent interpretation from the "look" of the language, rather than from the way it "sounds".

However, it is not until the silent reader can simultaneously recode and decode, that is, until he can obtain meaning directly from the graphic input, that full proficiency is attained. Goodman (1970), in discussing proficient silent reading, states "the basic decoding is directly from print to meaning, though there is some echo of speech involved as the reader proceeds even in silent reading (p. 18)." His model of a proficient silent reader is shown in Figure 2.2.

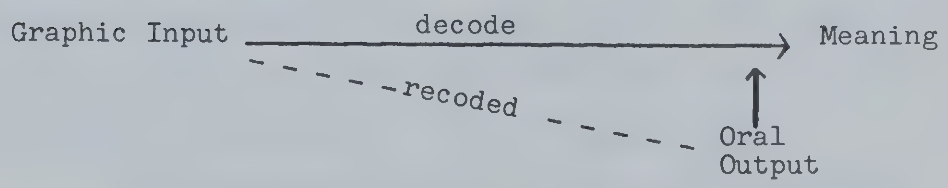


FIGURE 2.2

GOODMAN'S 1970 MODEL ILLUSTRATING
PROFICIENT SILENT READING

Obtaining meaning from the graphic input is essential. Otherwise "reading" is not taking place. Even at the least proficient beginning stages of learning to read, it is absolutely necessary that the child decode to meaning with some level of comprehension of larger language units - not just the meaning of an isolated word.

Oral Reading

A second, but less important output in reading, which can be analyzed to give some insights into the actual reading processes being used is the actual phonetic output in an oral reading performance. Although this in itself is far less important than comprehension, when combined with comprehension, it may provide very important clues which can contribute to a better understanding of the reading processes.

For one who has reached a level of proficiency in obtaining meaning directly from the graphic input, the processes of oral and silent reading may be very different.

Figure 2.3 indicates Goodman's model of a proficient silent reader reading orally.

$$\begin{tikzcd} \text{Graphic Input} \arrow[r, "\text{decode}"] \arrow[rr, bend left, dashed, "\text{recode}"] & \text{Meaning} \arrow[r, "\text{encode}"] & \text{Oral Output} \end{tikzcd}$$

FIGURE 2.3

GOODMAN'S 1970 MODEL OF A PROFICIENT SILENT READER READING ORALLY

In explaining Figure 2.3, Goodman states "primarily oral output is produced after meaning has been decoded and hence, though comprehension may be high, the oral output is often a poor match for the graphic input. The reader sounds clumsy and makes numerous errors (p. 19)." True, that if the oral reader is encoding the meaning to oral output, he is apt to "put it in his own words", and not have an exact match between oral output and graphic input. This may account for the "numerous errors" which Goodman mentions in his quotation, but it seems to the investigator that the "clumsiness" could also be the result of lack of comprehension of meaning, which Goodman recognizes in his model but does not attempt to explain: that is, the direct recoding from graphic input to oral output, without comprehension or meaning. In so far as there is the element of direct recoding from graphic input to oral output in the oral reading of an individual, there is no

comprehension, and hence it is not "reading". A more apt name for this type of exercise would be "word calling".

Although Goodman has included some aspects of direct recoding from graphic input to oral output even in his model of a proficient silent reader reading orally, it seems to the investigator that this element of direct recoding from graphic input to oral output would probably be much more pronounced in a model of a beginning reader reading orally. In addition, such a model would be expected to retain the recoding to aural input (see Figure 2.1) before meaning is obtained.

Figure 2.4 illustrates the investigator's assumption of what is possibly happening when a young beginning reader reads orally.

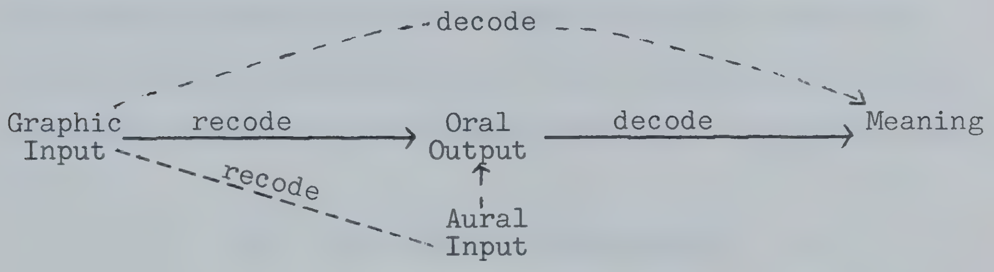


FIGURE 2.4

INVESTIGATOR'S MODEL OF
EARLY ORAL READING

The investigator maintains that the oral reading processes of a child learning to read and those of a skilled adult reader are not identical processes. She is supported in this view by Goodman (1968, 1970) and Smith (1971). It would seem that the young child, learning to read orally, may be using the same processes that he is using in silent reading, except that the aural language input of silent reading (Figure 2.1) becomes the oral language output in oral reading.

The assumption that the silent and oral reading processes of a young child learning to read are very similar, is basic to the present investigation and is supported by McCracken (1967) and Goodman (1968). Such an assumption seems reasonable, especially since it is now contended that an acceptable oral reading of a passage requires greater linguistic sophistication, more fully involving the reading process, than was ever previously thought to be the case (Chomsky and Halle, 1968, p. 50).

V. THE FOCUS OF THIS STUDY

Since obtaining meaning from the context should be the constant goal of a reader, and since the syntax and semantics of the language cannot be separated, then an effective use of the pause should help the reader to separate the graphic string of the surface structure into

meaningful units, and also contribute to a more effective storage of these items in the short-term memory.

Pause then can serve two obvious purposes in the processing of language: 1) it serves to separate the string into meaningful units for analyzing content, and 2) facilitates the storage of items in short-term memory. Any disturbance in these two uses of the pause in the processing of written language by children learning to read, may seriously impair their comprehension.

Research with adults has indicated that the grouping of words in reading orally is very consistent. Pause, in oral reading by adult fluent readers, always occurred at grammatical boundaries. Since a group of words, separated by pauses, has a certain cohesiveness, it follows that if this group is meaningful, it can more readily be stored as a unit in the short-term memory. It also follows that if this group lacks cohesiveness because of pausing within the group itself, then comprehension is likely to deteriorate.

The models of beginning silent reading (Figure 2.1) and beginning oral reading (Figure 2.4), both indicate that the child recodes to aural input and/or oral output before he decodes to meaning, or comprehension. If, during this intermittent step between graphic input and meaning (as indicated in the two models mentioned above), the young

beginning reader loses the cohesiveness of the word group because he pauses within this group, then such a disjunction may interfere with comprehension. As mentioned previously, on page 47, the pause used in this sense may very well be considered a part of the reading process. However, the pause may also be considered as one aspect of the phonetic output in oral reading, and as such can be measured.

If, as assumed in this study, the silent and oral reading processes of young beginning readers are comparable (see Figures 2.1 and 2.4), then an analysis of how these young children use timing cues (pauses) in their oral reading, and the relationship of the use of these cues to comprehension, (whether silent or oral comprehension), may provide some insights into some of the learning to read processes.

The present study will attempt to investigate, using an objective measurement of the pause, the relationship, if any, between the two outputs of reading: 1) silent and oral reading comprehension, and 2) the phonetic output, using only one aspect of this output - the pause.

The design of the study and the measurement of the pause (which will be described in the following Chapter) are such, that all data are completely objective and the investigation itself is a repeatable procedure. Such objectiveness and repeatability facilitate a duplication, or a corroboration of this investigation using other subjects from other geographical areas.

CHAPTER III

THE EXPERIMENTAL DESIGN

The design of this study is basically a three-way Analysis of Variance, grouping by silent reading comprehension scores, grade and sex.

This chapter will discuss the selection of the sample from the total population, a description of the various tests and analyses used, a summary of the Pilot Study, the procedures used in the administration and scoring of the tests, and the treatment of the data.

The methods used in analyzing the pause, in establishing reliability of these various analyses, and in obtaining reliability for the Word Recognition Test designed by the investigator, were determined by means of a Pilot Study. These reliability measures are discussed fully in conjunction with the sections entitled "Testing Instruments" and "Method of Analyzing the Pause". A description of the Pilot Study is placed after these two sections. By using this sequence, the reliability of the measurement is discussed in conjunction with the description of the measurement. In addition, no elaboration of the measurements are required in the section entitled "The Pilot Study", since they have already been fully discussed in the preceeding

sections.

I. SELECTION OF THE SAMPLE

The total test population available to the investigator included all the students attending Grades two and three in the Edmonton Catholic School System, during the months of January, February and March, 1972. The actual population selected by the investigator was the 299 children registered in Grades two and three of four schools in the South Side district of the City of Edmonton. These four schools were situated in adjacent districts, and were chosen in an effort to minimize the effects of differences in socio-economic background. The schools in this area of the city serve a population whose parents are largely of upper middle class socio-economic status. Thirty children (10 per cent of the population) were excluded from the sampling procedure because a second language was spoken in the home. It was deemed advisable, for the purposes of this investigation, to control for this variable, and to select children from totally English-speaking backgrounds.

After the exclusion of the children who were exposed to two languages, the remainder of the population was divided into groups of Average, Above-average and Below-average readers, on the basis of the results of the silent

reading comprehension standard scores of the Gates-MacGinitie Reading Tests, Form 1 (1965). Each year, during the last two weeks of January, all the children in Grades two and three of the Edmonton Catholic School System are administered these tests. Each grade level has a different test that has been standardized for that particular grade - Primary B for Grade two, and Primary C for Grade three. In the process of standardization of the Gates-MacGinitie Reading Tests, raw scores were adjusted so that for both grade levels, the means of the comprehension subtests are 50 and the standard deviations 10 (Technical Manual, 1965, p. 2). Only the standard scores of the silent reading comprehension subtests were considered for the purposes of this study.

The results of the Primary B and Primary C comprehension subtests for two previous years were made available to the investigator by officials at the Edmonton Catholic School Board Central Office. The Grade two average mean for the years 1970 and 1971 was 58. The Grade three average mean for these same two years was 55. Grade two children tended to score higher on the Primary B test than the Grade three children did on the Primary C test.

Since the Catholic School System means for these two grades were considerably higher than the means obtained in the standardization of the test, there was a possibility

that the population from which the sample for this investigation was to be drawn, was different from the population on which the test was standardized.

Consequently, means and standard deviations of the comprehension subtest scores obtained in January, 1972, were computed for the test population in the four schools assigned to the investigator. The Grade two mean was 57.3 with a standard deviation of 7.4. The Grade three mean was 55.6 with a standard deviation of 8.6. The test population then, was truly representative of the entire population of Grades two and three children in the Edmonton Catholic School System.

Using the means and standard deviations of the test population, a stratified random sampling procedure was utilized to select the test sample, employing a table of random numbers.

Twelve Average, twelve Above-average, and twelve Below-average readers were selected from each of Grades two and three, in the four schools, making a total sample of 72 children - six cells consisting of 12 children each. In each cell, the sexes were equally divided - six boys and six girls. The Grade two children had all been exposed to reading instruction for 1.5 years, and the Grade three

children, for 2.5 years.

Average readers in Grade two were selected from those children scoring between 56 and 58 on the silent reading comprehension subtest. Average readers in Grade three were selected from those children scoring between 55 and 57 on the silent reading comprehension subtest. Above-average readers in both grades were children who scored 1.2 or more standard deviations above the mean for the grade. This meant that, for both Grades two and three, Above-average readers were those children who obtained a standard score of 66 or more on the comprehension subtest for their respective grades. Below-average readers in both grades were children who scored 1.2 or more standard deviations below the mean for the grade. Grade two children scoring 48 or less, and Grade three children, scoring 45 or less on the comprehension subtests, were considered Below-average readers. Table 3.1 tabulates mean standard scores obtained by the test sample on the <u>Gates-MacGinitie Silent Reading Tests</u>, and also indicates the range of these scores in each of the silent reading groups.

Table 3.1 reveals that all groups in Grade two, except Above-average Grade two boys, tended to score higher than the comparable Grade three groups, on the

TABLE 3.1

MEAN STANDARD SCORES, AND RANGE OF SCORES, ON SILENT READING TEST BY GROUP, GRADE AND SEX

Gr.	Silent Reading Comprehension Group	Mean Standard Scores Boys	Girls	Total	Range of Scores
2	Above-average	67.0	68.5	67.8	66 - 72
	Average	56.2	56.7	56.4	56 - 58
	Below-average	46.2	46.2	46.2	42 - 48
3	Above-average	67.5	67.8	67.7	66 - 71
	Average	55.7	55.8	55.8	55 - 57
	Below-average	40.5	42.0	41.3	37 - 45

comprehension subtest designed for their respective grades. This may be due to an artifact in the tests themselves, or it may be that the Grade two children in the sample are more proficient in reading Grade two material than the Grade three children are in reading Grade three material. The discrepancy is especially noticeable when comparison is made between the Grade two Below-average readers and the Grade three Below-average readers. An additional year exposed to reading instruction seems to result in a deterioration for the Below-average reader, rather than an improvement.

Table 3.2 provides additional information on the test sample.

TABLE 3.2

MEAN AGES IN MONTHS, BY GROUP, GRADE AND SEX

Gr.	Silent Reading Comprehension Group	Age In Months		Total Group
		Boys	Girls	
2	Above-average	92.5	89.7	91.1
	Average	91.0	90.8	90.9
	Below-average	88.8	88.8	88.8
3	Above-average	104.2	103.8	104.0
	Average	101.0	104.0	102.5
	Below-average	103.3	104.0	103.7

This table indicates that, for the total group, the Below-average Grade two children are more than two months younger than the rest of the Grade two sample. The Below-average boys in Grade two are 3.7 months younger than the Above-average boys. The differences in ages among the Grade three groups do not exceed 1.2 months.

II. TESTING INSTRUMENTS

The seventy-two children, divided into six cells, as described above, were then administered the following tests

during the last two weeks of February and the first week of March, 1972.

Standardized Tests

Intelligence

The Lorge-Thorndike Intelligence Test, Level 2, Form A, was administered to all the subjects. These tests were administered in a group situation. After the individual tests were completed in each of the four schools, the children were grouped and administered the intelligence test by the investigator.

Table 3.3 reveals the means and range of intelligence quotients obtained by the sample on the Lorge Thorndike Intelligence Test, by sex, grade and silent reading comprehension ability.

Since the standard deviation of the Lorge-Thorndike is 16, only the means of the Above-average boys in Grade two, and the Above-average girls in Grade three might be considered slightly above the average range of this test, which is 84 - 116. Since the standard error of measurement of the test is 7.8, there is a good possibility that all the children in the sample fall within the average range of intelligence, as measured by this test. This hypothesis is tested in Chapter VI.

It is interesting to note, however, when considering only the actual mean scores obtained from the testing, that

TABLE 3.3

MEANS AND RANGE OF INTELLIGENCE QUOTIENTS
BY GROUP, GRADE AND SEX

Gr.	Silent Reading Comprehension Group	Intelligence Quotients			Range
		Boys	Girls	Total	
2	Above-average	119.3	113.0	116.2	103 - 123
	Average	110.0	100.0	105.0	87 - 123
	Below-average	97.5	105.7	101.0	91 - 112
3	Above-average	111.3	117.3	114.3	100 - 123
	Average	101.5	100.0	100.8	85 - 116
	Below-average	105.8	103.2	104.5	82 - 120

the Below-average readers in Grade three, -- those children in the sample who scored extremely low on the silent reading comprehension subtest, -- are slightly superior in intelligence to the Average Grade three readers. Similarily, the Below-average Grade two girls have a higher intelligent quotient than the Average Grade two girls.

Oral Reading

The oral reading performance of each child was determined by the administration of the Gilmore Oral Reading Test, Form C (1968). This is an individually administered

standardized test designed to analyze the oral reading performance of pupils in Grades one through eight. The test comprises ten oral reading passages which form a continuous story. There are five comprehension questions for each paragraph. The errors in reading the paragraph, the time required for the reading of each paragraph, and the responses to the comprehension questions at the end of each paragraph were recorded for each individual. Each child began to read orally at paragraph one. He then read each consecutive paragraph until he finished the paragraph on which he made ten or more errors. This was considered his ceiling for accuracy in oral reading performance. The child was then instructed to attempt one additional paragraph. The comprehension questions following this paragraph were administered. This was considered his comprehension ceiling.

Auditory Memory Span

Auditory memory span was measured by two subtests of the Weschler Intelligence Scale for Children (1949) designed for this purpose -- the digits-forward and digits-backward subtests. The subject is required to repeat after the examiner, the digits that he has heard pronounced. Each series of digits is pronounced at the rate of one per second. The digits-forward subtest comprises seven sets of digits.

Each set consists of two trials. The first set begins with a span of three digits. Each consecutive set increases the span by one digit. The final set contains nine digits. When the subject fails to respond correctly to both trials in a set, the test is terminated.

The digits-backward subtest is similar to the digits-forward, except that the subject is required to repeat each item in reverse order after he has heard it. The digits-backward test measures a span of two to eight digits. In each subtest the score is the longest series of digits that the child can repeat once.

Visual Memory Span

Visual memory span was tested by means of an adaptation of the subtest measuring visual memory span for letters in the Detroit Test of Learning Aptitudes (1967). This test consists of six sets of letters with four trials in each set. Each trial is printed in lower case letters on a separate card. The first set consists of two letters for each trial. Each consecutive set increases by one letter until a span of seven letters is reached. The child is allowed to look at a card one second for each letter on it. The card is then removed and the child must repeat, in exact order, what he has seen. For the purposes of

this investigation, the longest set which the child could repeat once correctly, was considered his visual memory span score.

Test Designed by Investigator

Word Recognition

In order to determine whether the pause before a word in the oral reading of a subject was due to the lack of word recognition skills, a Word Recognition Test was composed by the investigator (see Appendix A). This test included all the words occurring at least once in the Gilmore Oral Reading Test, Form C.

After the child had read the oral reading passages, he was administered the Word Recognition Test, up to and including all those words contained in the last paragraph read. It was assumed that if a child hesitated for more than two seconds before pronouncing a word on this test, or if the word was incorrectly pronounced, that the pause occurring before this word in the oral reading performance of this child, was due to lack of word recognition skills.

Reliability: The reliability of the Word Recognition Test was determined in the Pilot Study (to be described later), by means of a test-retest correlation coefficient. The correlation of the two sets of measurements was comput-

ed at .99, which indicated that the children in the Pilot Study performed almost exactly the same the second time they were administered the <u>Word Recognition Test</u>, as they did the first time. In order to avoid the possibility of the children learning additional new words, even over the period of two days, the test and retest were administered on the same day, separated by a recess period and approximately a sixty minute time period.

<u>Validity</u>: The <u>Word Recognition Test</u> has face validity. It comprises all the words which had been included at least once in the <u>Gilmore Oral Reading Test, Form C</u>. The child was required to look at the word and to show that he recognized the word by pronouncing it aloud. If he said the word correctly, as judged by the examiner, it was considered a valid measure of word recognition. Failure to pronounce the word, or a hesitation of two seconds or more before attempting to pronounce the word, was taken as evidence that the child did not recognize the word. A two-second hesitation is the time period stipulated in the <u>Gilmore Oral Reading Test</u> as an error in accuracy of oral reading (<u>Manual</u>, 1968, p. 7). It was therefore considered as a criterion for accuracy in the <u>Word Recognition Test</u>.

III. METHOD OF ANALYZING THE PAUSE

Before attempting to collect data relating to paus-

ing in oral reading, it was necessary to establish 1) at what positions in the orthographic surface structure of the reading text the pauses would be measured,2)the reliability of the pausing phenomena used by children when reading orally, 3) a criterion pause for each subject, and 4) objectivity in the analyses of the pause.

The Syntactic Constituent

The syntactic constituent, referred to in this study, has been defined in Chapter I.

In order to determine whether a pause in oral reading was between or within a syntactic constituent, each paragraph of the investigator's copy of the Gilmore Oral Reading Test, Form C, was divided into syntactic constituents, using the linguistic algorithm proposed by Latham (1972) and described in Chapter 1. These divisions into syntactic constituents were double-checked by a staff member of the Department of Linguistics, University of Alberta. See Appendix B for a copy of these divisions.

Each child read from the standardized test copy and was not exposed to any physical aberrations of the text.

Reliability: The fundamental index of the reliability of using a linguistic algorithm to divide the oral reading text into syntactic constituents is that, using this algorithm, the division of the text into syntactic consti-

tuents would remain rigorously stable over time, with no variation in the placement of divisions, irrespective of when the divisions were made, or by whom.

Consistency of the Pause Phenomena in Reading

Empirical evidence presented in Chapter II, combined with the evidence readily perceived in listening to children read orally, leaves no doubt that there is such a phenomenon as pausing in oral reading.

In addition, the Pilot Study, to be described in the next section, confirmed that these pauses sometimes occur between syntactic constituents (as defined in this study), and sometimes occur within the syntactic constituent.

Further, the Pilot Study indicated that in determining pauses within syntactic constituents while children were reading orally, it was necessary to include not only pauses between the words of the constituent, but also any inter-phonetic pausing within the words themselves - that is, pausing between the syllables of a word.

The studies on pausing which recognized the possibility of inter-phonetic pausing have deliberately avoided including this type of pause. They did this by defining the pause as a sufficiently large enough time interval to enable them to exclude any inter-phonetic pausing in their data (Goldman-Eisler, 1968; Boomer and

Dittman, 1962; Martin, 1970). However, these investigators were interested in pausing as it occurred in the spontaneous speech of adults.

The empirical data collected in the Pilot Study, indicated that when children read orally, a great deal of inter-phonetic pausing occurs. It was then, essential to include this measurement in determining pauses within syntactic constituents. Otherwise the data would not have been complete.

Reliability: The Pilot Study mentioned above, and described in detail later, indicated that the reliability of the child's performance in pausing within syntactic constituents and between syntactic constituents, increased with the number of syntactic constituents read. Using the split-half technique on both the mean length of pause within syntactic constituents, and the mean length of pause between syntactic constituents, the correlations were found to increase as the number of syntactic constituents read, increased. See Table 3.4

Therefore, it was felt that in order to establish reliability of the pause phenomenon in oral reading, it would be necessary for each subject to read at least 70 syntactic constituents. One subject was excluded from the sample and replaced by another chosen randomly, because of

TABLE 3.4

RELIABILITY OF PAUSING PHENOMENON

Number of syntactic constituents read	Split-half reliability coefficient on mean length of pauses within syntactic constituents	Split-half reliability coefficient on mean length of pauses between syntactic constituents
42	.53	.24
70	.92	.97
150	.98	.96

inability to read the required number of syntactic constituents. All subjects in this investigation read at least 70 syntactic constituents of the <u>Gilmore Oral Reading Test</u>, <u>Form C</u>. The mean number of syntactic constituents read by the children in the test sample are shown in Table 3.5.

<u>Establishing Criterion Pause</u>

Before any data were collected on a subject, it was necessary to establish what constituted a pause for that subject. The establishment of a criterion pause for each subject corresponded well with the concept of the pause which the investigator wished to measure.

Many of the studies related to pausing relied

TABLE 3.5

MEAN NUMBER OF SYNTACTIC CONSTITUENTS READ BY GROUP, GRADE AND SEX

Gr.	Silent Reading Comprehension Group	Mean Number of Syntactic Constituents read			
		Boys	Girls	Total	Range
2	Above-average	163.0	104.5	154.1	108-206
	Average	128.2	111.2	119.7	108-202
	Below-average	98.8	103.8	101.3	70-122
3	Above-average	188.8	213.5	201.2	111-254
	Average	181.2	180.0	180.6	110-206
	Below-average	99.0	108.2	103.6	71-158

totally on listener-judgment to detect the pause (Maclay and Osgood, 1959; Tannebaum, Williams and Hillier, 1965; Martin and Strange, 1968). Other studies defined the pause in terms of one time interval. Goldman-Eisler (1968) established as her criterion, a pause of 250 milliseconds. Boomer and Dittman (1962) used a pause of 200 milliseconds as their measurement. Martin (1970) set his pause criterion as more than 50 milliseconds.

In this study, a criterion pause was established for each child in an attempt to control for the variable of

rate of articulation.

Before administering the oral reading test, each subject was required to read a set of nine sentences. These sentences were based on passages at the Grades one, two and three levels of the Gilmore Oral Reading Test, Form D, an equivalent form of the oral reading test being used. These sentences contained ten syntactic constituents randomly selected as the bases for measuring rate of phonetic output in the oral reading of a passage. See Appendix C.

Before reading this set of sentences aloud, the subject was allowed to examine the material in order to assure that hesitations would not be due to lack of word recognition. The child then read the sentences aloud. These data were taped to display graphically (to be explained below), using the same machinery necessary for recording his oral reading performance.

Each subject's criterion pause was established as the average pause in milliseconds between the words in the ten syntactic constituents. Data from the Pilot Study indicated that a linear transformation of 2.5 times the criterion pause constituted a "significant pause" in the phonetic output of each subject. That is, a pause of this duration was perceptible as a cessation of phonation in the speech and oral reading of the subject.

Reliability: The reliability of the criterion pause and its transformation - the significant pause - was established in the Pilot Study by a test-retest procedure, using the same ten syntactic constituents and the same method of administration and scoring, which were later used in the main study.

Two sets of measurements were taken for each child, separated by a period of sixteen days. The Pearson product moment correlation between these two sets of measurements was calculated at .96. This high correlation indicated that the children in the Pilot Study were consistent in their performance, and that a child's criterion pause (or significant pause when subjected to the linear transformation), did not vary.

Although each child's significant pause remained consistent, there was great variation between children. Table 3.6 tabulates the mean length of significant pauses, by group, grade and sex, for the test sample.

Table 3.6 reveals why an arbitrarily chosen pause of a designated number of milliseconds would have distorted the data. If a very short length of time was taken as the pause measurement, then those children who produce phonetic output slowly would have been penalized. If a longer

TABLE 3.6

MEAN LENGTH OF SIGNIFICANT PAUSES
BY GROUP, GRADE AND SEX

Gr.	Silent Reading Comprehension Group	Mean Length of Significant Pause in Milliseconds Boys	Girls	Total	Range
2	Above-average	62.0	141.8	101.9	16-252
	Average	69.8	113.8	91.8	29-136
	Below-average	84.2	94.3	89.3	53-150
3	Above-average	68.5	85.3	76.9	10-181
	Average	60.8	66.7	63.8	10-126
	Below-average	137.7	111.3	124.5	63-299

period of time constituted the definition of the pause, then much of the data on fast articulators would have been lost.

Objectivity in Analyzing the Pause

The number, duration and placement of pauses in oral reading was determined by processing the recorded tape of the oral reading of each subject through an Esterline Angus Speedservo AZAZ portable Labgraph. See Appendix D.

A pause measuring devise requires two parameters -

an amplitude threshold below which acoustic energy is measured as a pause, and a temporal duration figure which specifies how long an acoustic measure must fall below the amplitude threshold before it is considered a pause.

The labgraph used in this study is a device that records on a strip chart, a graphic display of the input voltage applied to the input terminals. The amplitude of the input signal, and the time interval, or period, can be read directly from the chart. The machine is precise (with an error of ± .005), and a frequency response of 100 per cent of the input which falls between 40 and 20,000 c.p.s. Input can be varied by exact steps with front panel controls. (The labgraph may also be adapted for use in measuring stress and/or pitch -- phonemes of the suprasegmental system of which pause, or juncture, is one aspect).

A permanent record of the voice recorded on magnetic tape is displayed on the strip chart in red ink. This was accomplished by feeding the recorded voice through a signal conditioner, consisting of a diode resistor network, to get a suitable rectified signal on the strip chart. The signal conditioner attached to the output of the recorder was a special device which attempted to control the amplitude threshold relative to peak amplitudes, so that there would be a display of the voice signal only, and to remove from the graphic trace any extraneous noises. The amplitude of the input signal controlled the deflection of a stylus, which was directed toward the moving strip of

graph paper, and produced a permanent visual display of changes in the input signal over time - in amplitude, horizontically, and in time, vertically. The machine was set for a stylus deflection of nine on a ten-point scale, without overloading the tracing operation.

Speech sounds on the strip chart were displayed as oscillations to the right of the baseline on the ten-point amplitude scale, while pauses were displayed as time intervals along the baseline. For the purposes of this study, the chart drive was set a .75 inches per second, which enabled the investigator to measure a pause as small as 10 milliseconds if necessary. The detection of the pause, then, was limited only by the integration time constants of the measurement apparatus.

Samples of the graphic display of the oral reading performance of four children are shown in Figures 3.1, 3.2, 3.3 and 3.4.

For the purpose of comparison an arbitrary sentence, taken from the Gilmore Oral Reading Test, Form C, was chosen for the display on each graph. The sentence is "Mother will walk to the store".

Figure 3.1 displays, in graphic form, the oral reading of a very slow Grade two Below-average reader. It took the child 8,819 msec. to read the sentence, and the long

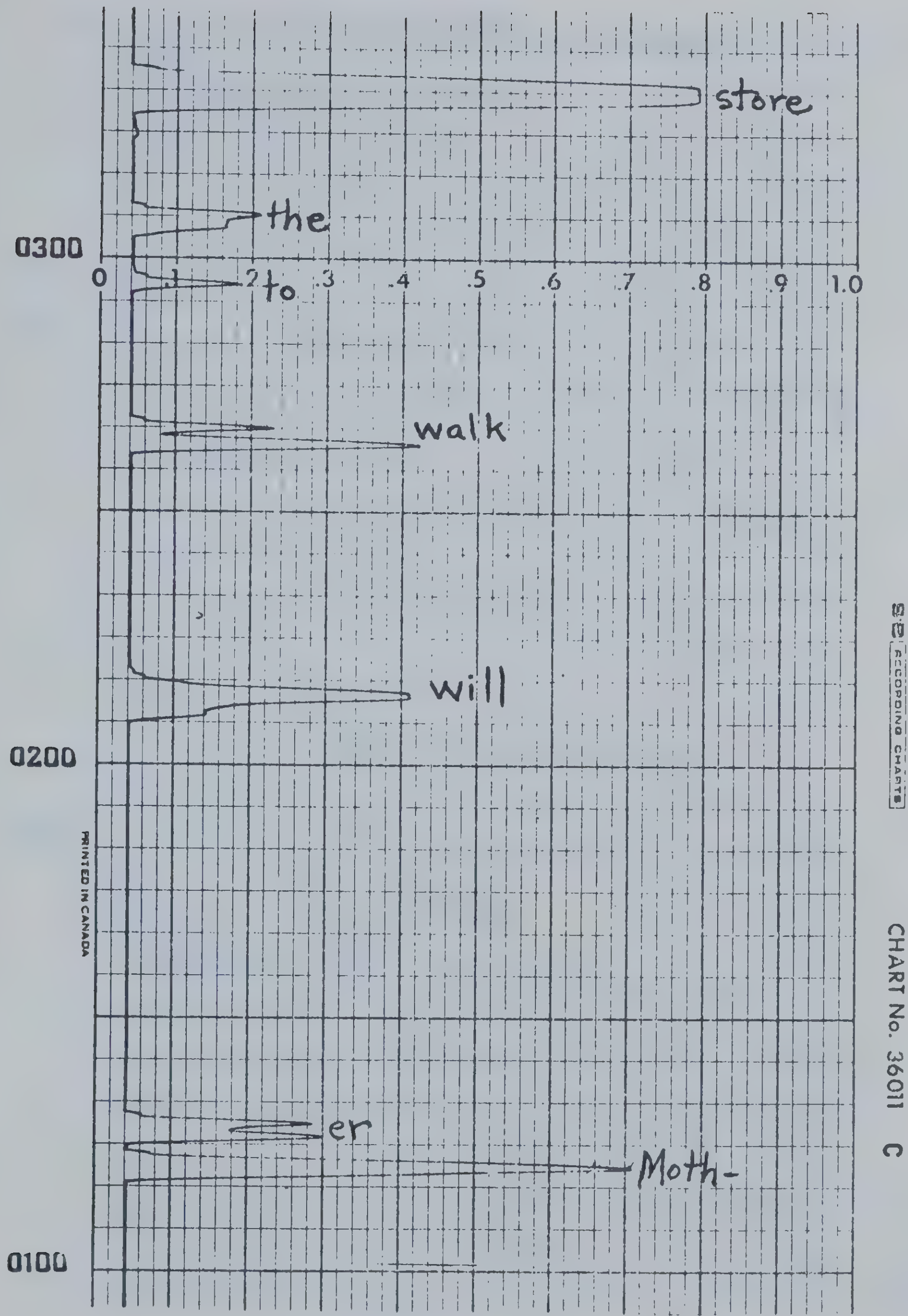


FIGURE 3.1

GRADE TWO BELOW-AVERAGE READER

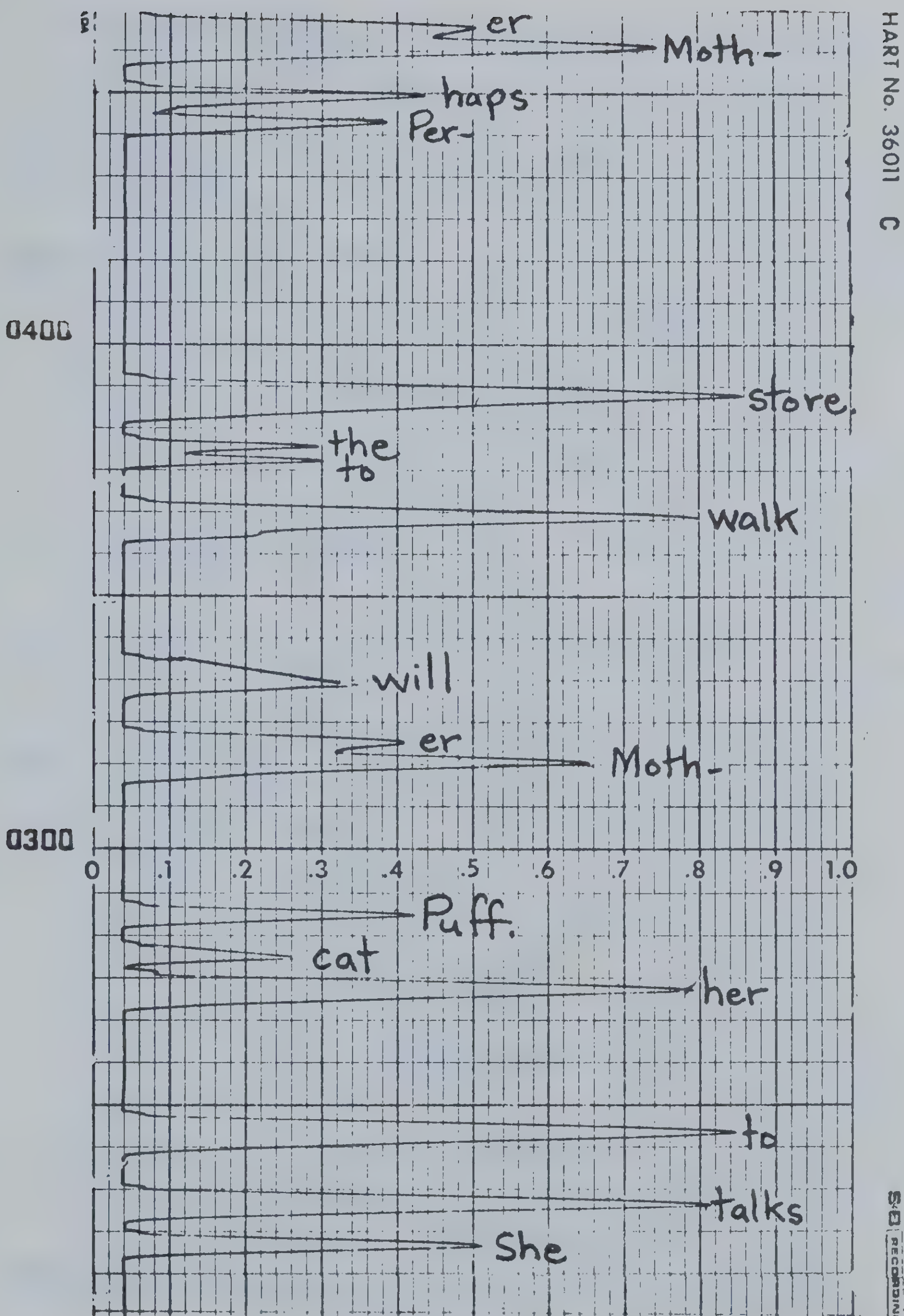


FIGURE 3.2

GRADE THREE BELOW-AVERAGE READER

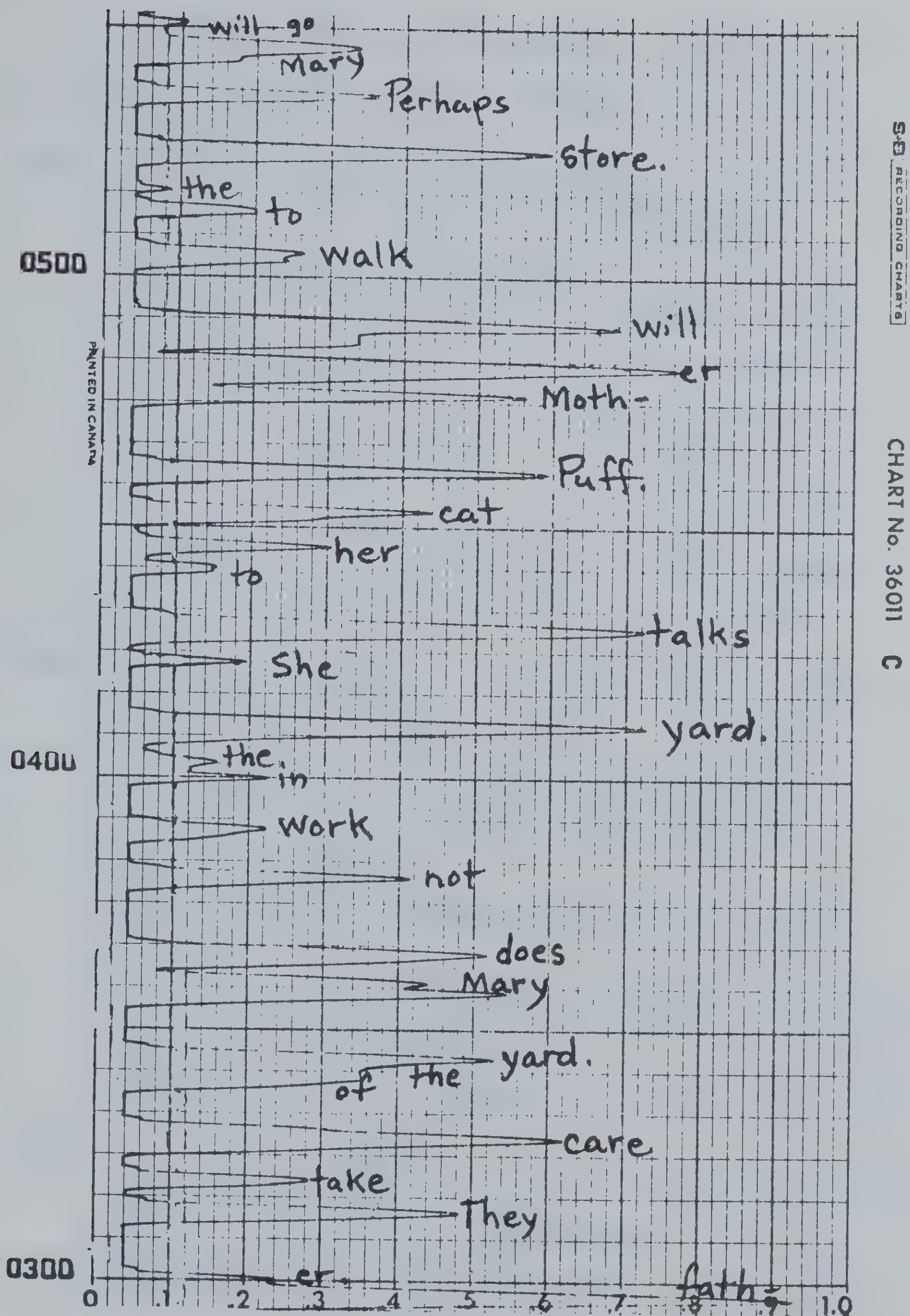


FIGURE 3.3

GRADE THREE AVERAGE READER

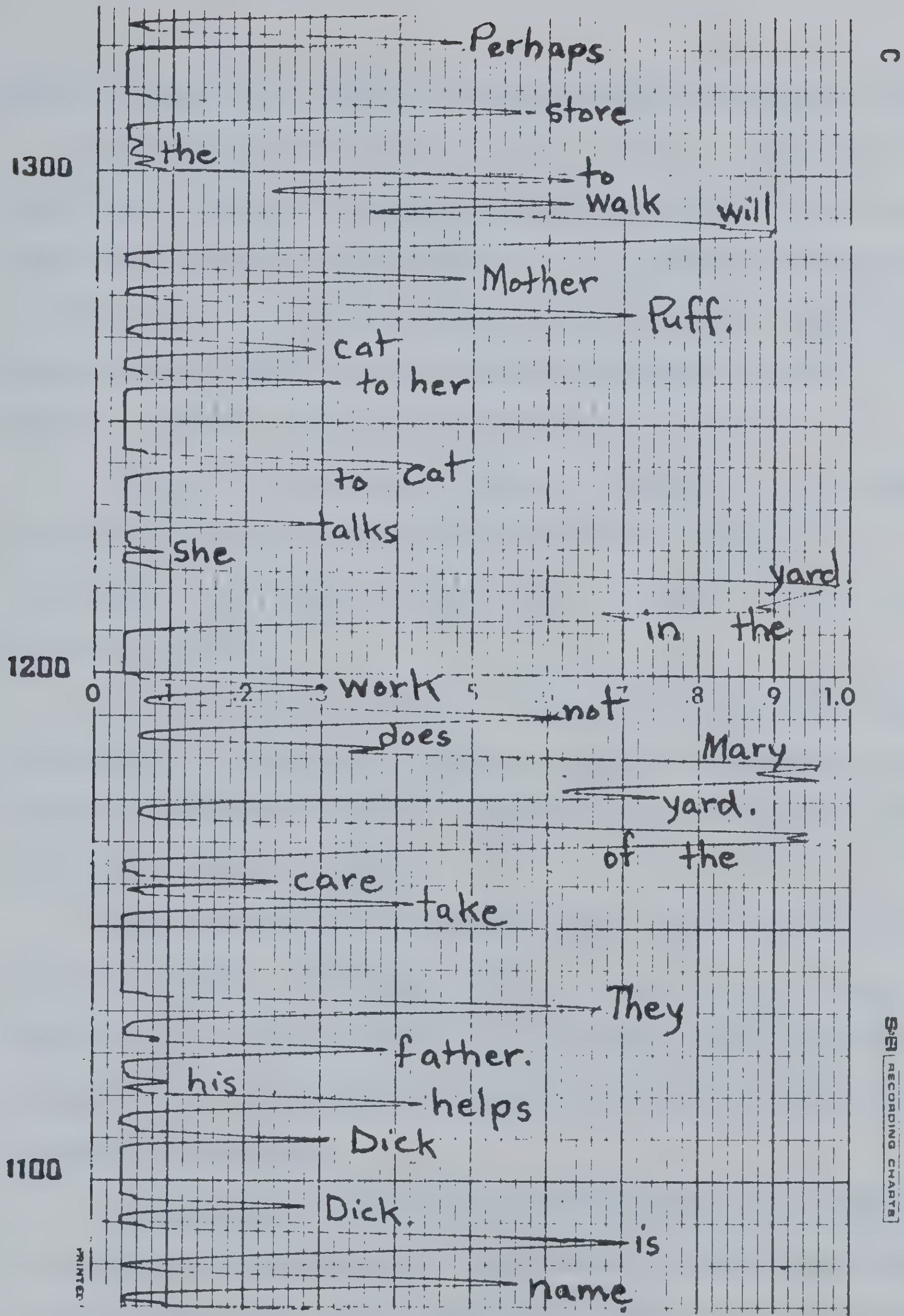


FIGURE 3.4

GRADE THREE ABOVE-AVERAGE READER

pauses between each word in the sentence are easily visible.

In Figure 3.2, which is the graph of a Below-average Grade three reader reading the same sentence, it is evident that the child read much faster. He completed the sentence in 3,228 msec. The long pause between "will...walk" is easily seen. There are also shorter pauses between "Mother...will", "walk...to", and "the...store".

Figure 3.3 displays the oral output of an Average Grade three reader. This child read the sentence in 2,178 msec. and paused between "will...walk", "walk...to", and "the...store".

An Above-average Grade three reader read the same sentence in 1,562 msec., and her reading is displayed in Figure 3.4. There is also a pause between "Mother...will", and between "the...store".

All the Figures represent equal time intervals on the chart paper. The graph of the Above-average Grade three child reveals a fluent oral reader, while the Below-average Grade two graphic output indicates a child having extreme difficulties.

<u>Reliability</u>: The pause determined by the labgraph is a physical measurement. Regardless of how many times the same section of audio tape was played into the machine, the graphic display of the pause was consistent when

comparisons between duplicate and triplicate copies of the same sample were made.

The labgraph and signal conditioner were set up, adjusted, and serviced throughout the process of data collecting by an engineer from the Electronics Division of the Technical Services Department, University of Alberta.

IV. THE PILOT STUDY

A Pilot Study was conducted three weeks prior to the actual data collection to determine:

(a) the range of the ceiling passages of the oral reading test which could be read by Below-average Grade two readers and Above-average Grade three readers,

(b) the number of syntactic constituents it would be necessary for each subject to read in order to establish a relatively consistent pausing phenomenon while reading orally,

(c) the number of trial syntactic constituents needed to establish a valid and reliable criterion pause for each subject,

(d) the critical interval of pausing, and the linear transformation necessary to determine a significant pause,

(e) the amplitude level, as registered on a VU meter, at which magnetic tape recordings should be made,

(f) the optimum amplitude level at which the output signal from the tape recorder should be played, in order to produce optimum stability and to maximize sensitivity of the input signal to the graphic recorder. The investigator was assisted during these trial runs by an engineer from the Electronics Division of Technical Services, University of Alberta.

(g) the inter-judge reliability coefficient of the actual pause measurement,

(h) the reliability coefficient, using test-retest procedure, for the Word Recognition Test,

(i) the time required to administer all the tests to individual children, and an estimate of the time required to process the oral reading of a subject through the diod resistor network and labgraph to produce a visual display.

(j) The Pilot Study also provided the investigator with practice in administering the tests, in operating the audio and graphic recorders, and in interpreting the graphic trace.

Twelve children, six from each of Grades two and three, constituted the subjects for the Pilot Study. These children were designated by their teachers as Average, Above-average and Below-average readers.

In preparing for the Pilot Study, it was evident that Grade one children could not be included in the sample. Below-average Grade one children, at that time of year when data were beginning to be collected (January), could not read adequately even 17 syntactic constituents (or the first paragraph) of the Gilmore Oral Reading Test, Form C.

Each of the twelve children in the Pilot Study was given the entire battery of individual tests. Audio recordings were made of the oral reading samples, and the tapes thus procured were played into the labgraph and visual tracings made.

On the basis of this Pilot Study, the following decisions were made:

(a) The Gilmore Oral Reading Test, Form C, divided into syntactic constituents as proposed by Latham (1972), is a suitable instrument for determining the pause phenomenon in oral reading.

(b) The performance of subjects in relation to pausing between and within syntactic constituents, while reading orally, is consistent if enough oral reading material is provided. This was determined by means of calculating the split-half reliability coefficient on the mean length of pauses between syntactic constituents, and the split-half reliability coefficient on the mean length of pauses within

syntactic constituents. The reliability of the actual pausing phenomenona increased with the number of syntactic constituents read. It was therefore determined necessary that each subject read no less than 70 syntactic constituents.

(c) That to determine a subject's rate of phonation, in order to establish a "criterion pause", it was necessary that all words he was required to read in the trial syntactic constituents were known to him. The sentences were then presented to each subject and he was allowed to read them before these trials were recorded. By using this method it was felt that when the child actually read the trial sentences for recording, he was reading in his "natural" voice and knew the words. It was assumed that pausing during these readings was not due to hesitations because of lack of word recognition.

(d) That for each subject, nine trial sentences, consisting of ten syntactic constituents from which sixteen measurements were made,were sufficient to establish the length of pausing between words of a syntactic constituent.

A Repeated Measures Analysis of Variance on Pilot data, collected on two separate occasions, at

a sixteen-day interval, for the same subjects, revealed no significant differences between the means of the significant pauses on both occasions. The correlation coefficient for the two sets of measurements was .96 indicating sufficient reliability in this method of establishing a significant pause.

(e) The optimum recording level, as registered on a VU meter was zero decibels $\pm$ 2.5.

(f) Five judges were requested to measure a random sampling of pauses, indicated by tracings along the baseline of the graphic output. The inter-judge correlation ranged between .98 and 1.

(g) To determine the oral reading comprehension score, the decision was made to administer an additional passage beyond the accuracy ceiling of each subject. Before this passage was administered, the subject was told that he would be given no help with words, even if he hesitated longer than the five seconds indicated in the Manual of the <u>Gilmore</u>. This was to prevent a comprehension score being derived from what might easily become a listening situation rather than a reading situation. Subjects reading this final paragraph were encouraged to omit words they did not recognize. Only the comprehension

score of this final passage was included in the final data. The pausing and word recognition data terminated at the accuracy ceiling.

(h) A number of decisions were also made, on the basis of the Pilot Study, as to the criteria to be used in scoring the graphic trace in the analyses. See Appendix E.

V. PROCEDURES OF DATA COLLECTING

All data were collected by the investigator during the period from the last week in January, 1972, until the end of the first week of March, 1972. All tests, except the intelligence test, were individually administered by the investigator. The intelligence tests were also administered by the investigator, but in a group situation.

Oral Recording

The oral reading of each subject was recorded on a Uher-4000 Recorder-Reproducer, using 1½ mills audio tape, at a speed of 7½ ips. The Uher 153 dynamic microphone with shield, was attached to this instrument.

The frequency response of the Uher-4000 at a speed of 7½ ips is 40 to 20,000 c.p.s. See Appendix F for the technical description of this instrument.

The recorded amplitude of each recording was kept

constant by means of the Uher VU meter, which was set to peak at zero decibels $\pm$ 2.5.

After the completion of the oral reading test, the Word Recognition Test was administered to each subject, followed by the Auditory Memory Span subtest and the Visual Memory Span subtest. The intelligence tests were group administered after all the subjects in one school had completed the individual tests.

Graphic Recording

The taped oral reading performance of each child was played into the Esterline Angus Speedservo AZAZ portable labgraph through the diod resistor network, and a visible display of the reading obtained. The output from the Uher, through the diod resistor network, into the graphic recorder was kept constant for each reading and set for an amplitude reading of nine on a ten-point scale. This produced a stable reading at all times between zero and ten on the graph paper. Each oscillation to the right of the baseline on the graph represented a phonetic output to which a text had to be appended. This part of the data collection was done entirely by the investigator.

Measurement of the Pause

The investigator and one assistant, a doctoral candidate at the University of Alberta, measured all the

pauses. These were recorded as time intervals along the baseline of the graphic trace for each subject.

<u>Placement of Pause</u>

As mentioned above, the text of each child's oral reading performance was transcribed on to the corresponding graphic trace, so that the deviations from the baseline in the graph coincided with the syllables in the child's oral output. Using a copy of the oral reading test divided into syntactic constituents employing the linguistic algorithm (see Appendix B) it was then possible to compare the graphic trace of each child's oral reading performance with the actual text of the oral reading test divided into syntactic constituents, and to determine whether a pause occurred between a syntactic constituent, or within a syntactic constituent. This procedure was done entirely by the investigator.

VI. ANALYSES OF THE DATA

Since not all subjects were exposed to an equal number of oral reading comprehension questions, nor read an equal number of syntactic constituents, and since the time required to read orally varied with each child, many of the scores required for the data cards had to be expressed as ratios.

All the information obtained from the testing program for each subject was punched on data cards and processed by computer by the Division of Educational Research Services at the University of Alberta.

The variables related to pausing were generated by using four different approaches to measuring the pauses: 1) Controlling for word recognition: the significant pause interval for each subject was used if it was determined the pause occurred because of lack of word recognition ability, as indicated by results of the Word Recognition Test for that subject. The significant pause measurement was also the measurement used for a pause occurring prior to a prompt (which occurred after a hesitation period of five seconds), or to a hesitation of two or more seconds in the actual oral reading performance of the subject. Hesitations and prompts are considered as accuracy errors on the Gilmore Oral Reading Test, Form C; 2) Eliminating pauses due to lack of word recognition, prompts, or hesitations as mentioned above. The number and length of any such pauses were subtracted from the data of each subject; 3) Including the pauses due to lack of word recognition ability, prompts and hesitations. All such pauses were measured exactly as they occurred, and these measurements included in the data for each child; 4) Analyses of all the variables over the first three paragraphs of the Gilmore Oral Reading Test, Form C, which were the paragraphs read in common by all subjects included in the sample.

In summary, the dependent variables were:

Percentage of total reading time spent in pausing while reading orally the complete test; and also the first 70 syntactic constituents of the test,

when the effect of inadequate word recognition ability was controlled;

when the effect of inadequate word recognition was eliminated from the data;

when the effect of inadequate word recognition was included in the data.

Time spent pausing within syntactic constituents while reading orally the complete test; and also the first 70 syntactic constituents of the test,

when the effect of inadequate word recognition ability was controlled;

when the effect of inadequate word recognition was eliminated from the data;

when the effect of inadequate word recognition was included in the data.

Number of pauses made within syntactic constituents while reading orally the complete test; and also the first 70 syntactic constituents of the test,

when the effect of inadequate word recognition ability was eliminated from the data;

when the effect of inadequate word recognition was included in the data.

The average length of pause within syntactic constituents while reading orally the complete test; and also the first 70 syntactic constituents of the test,

when the effect of inadequate word recognition ability was controlled;

when the effect of inadequate word recognition ability was eliminated from the data;

when the effect of inadequate word recognition was included in the data.

Three-Way Analyses of Variance

The data basic to the study was analyzed by a three-way Analysis of Variance, grouping by Silent Reading Comprehension Group, Grade and Sex. This analysis was computed over 29 variables, and enabled the investigator to test Hypotheses one, two, three and four. In addition, data from this three-way Analysis of Variance was also used in the discussion of Hypotheses nine, and eleven, and the testing of Hypothesis ten.

A second three-way Analysis of Variance grouped according to Oral Reading Comprehension Group, Grade and Sex. Grouping by oral reading comprehension scores was obtained by tabulating the oral reading comprehension scores for each grade, in descending order, from the highest to the lowest, and assigning the first twelve scores to the First Group, the second set of twelve scores to the Second Group, and the lowest twelve to the Third Group. This method was not nearly as stringent as that used to obtain the silent reading groups, but it was felt that such an analysis might add additional information to the findings. These data were used when Hypotheses five, six, seven and eight were discussed. This three-way Analysis also provided information when Hypotheses nine and ten were discussed, and to test Hypothesis eleven.

Correlations

Correlations were used to test Hypotheses five, six, seven, eight and nine.

Correlations were calculated between all pairs of the following 14 variables, for each grade level and for the total sample:

Silent Reading Comprehension Scores

Oral Reading Comprehension Scores

Ratio: total pause time to total reading time - entire test

Ratio: pausing time within syntactic constituents to total reading time - entire test

Ratio: number of pauses within syntactic constituents to number of opportunities to pause - entire test

Average length of pause within syntactic constituent - entire test

Ratio: total pause time to total reading time - first 70 syntactic constituents

Ratio: pausing time within syntactic constituents to total reading time - first 70 syntactic constituents

Number of pauses within syntactic constituents - first 70 syntactic constituents

Average length of pause within syntactic constituent - first three paragraphs

Digit Span Forward

Digit Span Backward

Visual Letter Span

Intelligence.

VII. SUMMARY

The test sample was acquired by means of a stratified random sampling procedure on the basis of silent reading comprehension scores, in order to assure the acquisition of three distinct groups - Above-average, Average and Below-average readers. These three groups, at each of two grade levels, consisted of equal n's, with sexes equally divided in each group.

The basic design of the study is a three-way Analysis of Variance, over silent reading group, grade and sex, on a number of pause measurements obtained from the oral reading performance of the test sample. These pause measurements constitute the main dependent variables in the study and were obtained objectively. Other dependent variables include auditory and visual memory span measurements, and intelligence.

In addition, the relationship between the oral reading comprehension scores of the test sample, and the various dependent variables included in the study, will be examined by means of correlation coefficients and a three-way Analysis of Variance, grouping by oral reading comprehension, grade and sex.

Data will be analyzed over the entire oral reading material read by the subjects, and then over the first 70 syntactic constituents, which constituted the oral reading

material read in common by the entire sample.

In each of these analyses, three approaches will be used: 1) controlling for lack of word recognition abilities; 2) eliminating data due to lack of word recognition abilities; and 3) including all the measurements due to lack of word recognition skills.

CHAPTER IV

FINDINGS: PAUSING VARIABLES AND SILENT READING COMPREHENSION GROUPS

I. INTRODUCTION

Chapter IV is primarily concerned with Hypothesis one, two, three and four of the study: to determine whether various pause phenomena in oral reading differentiate between Above-average, Average, and Below-average readers, as determined by silent reading comprehension groups. For the purposes of brevity and clarity these groups are designated by the letters "H", "Av.", and "L", respectively, in the graphs contained in this chapter, and in tabulating the tests of significance, and graphs contained in Appendix H. Since the design of the study was constructed in order to determine these silent reading groups, this part of the analysis of the data is considered to be of primary importance.

The Analysis of Variance Tables from which the data in this chapter were compiled may be found in Appendix G. Factors A, B, and C indicate silent reading group, grade and sex, respectively. The Tables of Means, tabulated according to reading group, sex and grade, which were used to plot the graphs, may be found in Appendix H. Also included in Appendix H are the Scheffé tests of significant differences between means, and the interaction graphs.

All tests of significant differences between means are Scheffé "a posteriori" contrasts. This procedure is a very conservative test of significance. Since this study is in the nature of a first attempt of its kind, it was felt essential that no Type One error be allowed to occur; that is, that there would be little possibility of rejecting a true null hypothesis. Therefore the most conservative test of significance was chosen in preference to others which were available to the investigator.

The four main variables considered for discussion in this chapter are: 1) percentage of total reading time spent in pausing, 2) percentage of reading time spent in pausing within syntactic constituents, 3) actual number of pauses made within syntactic constituents, and 4) the average length of the pause within syntactic constituents.

The variables are analyzed in three ways as explained in Chapter III. In the graphs contained in this chapter, these three methods are labelled "W. R. Controlled", " W. R. Out", and "W. R. In", indicating: 1) that word recognition abilities were held constant by use of the significant pause for each subject, 2) that all effects due to lack of word recognition abilities were removed from the data, and 3) that the data were left intact, which included number and length of pauses due to lack of word recognition abilities.

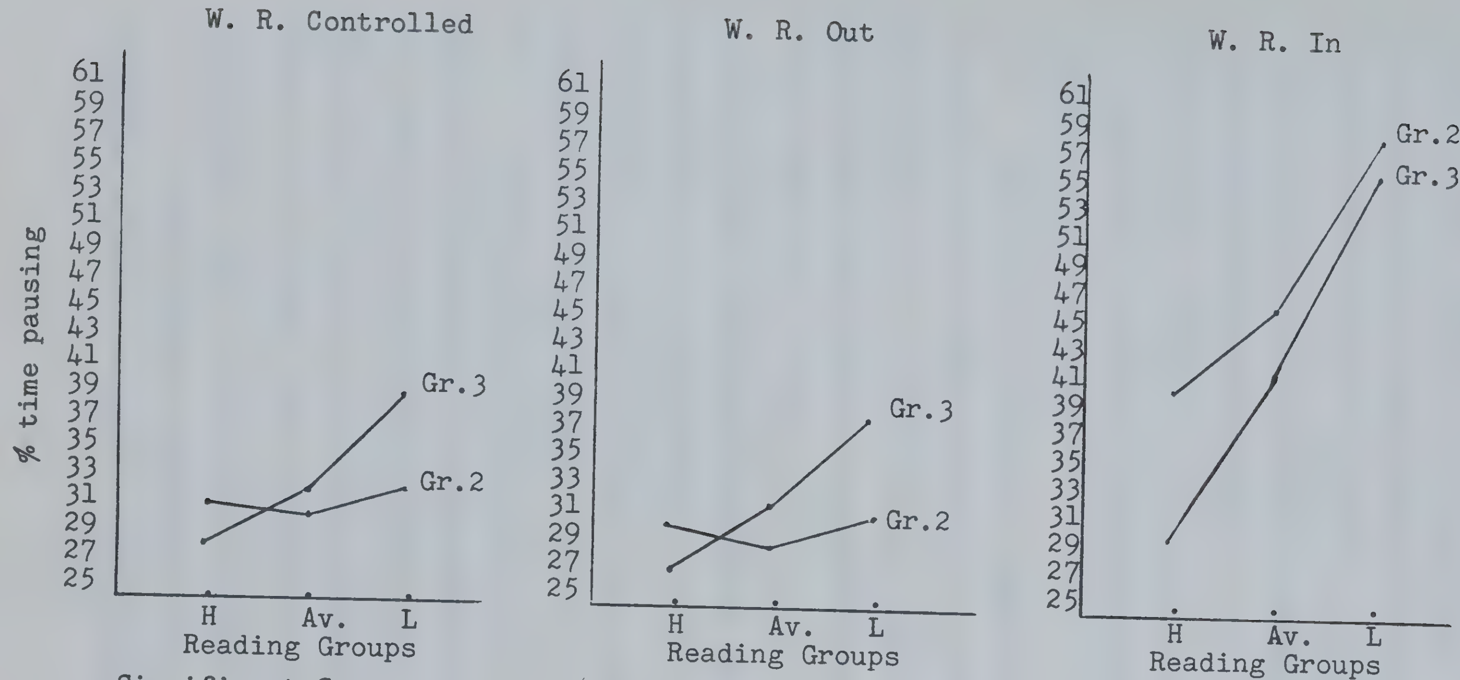
Further analyses of the four pausing variables, using the three criteria mentioned above, are concerned only with the oral reading material that was read by all the sample in common, which was the first 70 syntactic constituents, or the first three paragraphs of the Gilmore Oral Reading Test, Form C.

II. PERCENTAGE OF TOTAL READING TIME SPENT IN PAUSING

On the entire Oral Reading Material

Figure 4.11 reveals that regardless of whether word recognition abilities are controlled, eliminated, or included in the data, the percentage of time spent in pausing while reading orally, significantly discriminates between reading ability groups. However, only when lack of word recognition is included in the data (W. R. In), is there a significant difference between all groups (Groups H - Av., $p < .05$; Groups Av. - L, $p < .01$; Groups H - L, $p < .01$). See Table H.3, Appendix H. At each grade level, the Above-average readers consistently used significantly less pause time than did the Average readers, while the Average readers used significantly less pause time than did the Below-average readers.

When word recognition is controlled (Table and Figure H.1, Appendix H) there is a significant difference between



Significant Sources of Variance:

W. R. Controlled		W. R. Out		W. R. In	
Group	(p=.001)	Group	(p=.001)	Group	(p=.000001)
Group-Grade	(p=.04)	Group-Grade	(p=.04)	Grade	(p=.01)

FIGURE 4.11

PERCENTAGE OF TOTAL READING TIME SPENT IN PAUSING

The data from which these graphs were constructed are found in Appendices G and H.

Above-average and Below-average groups only ($p < .01$). When word recognition is completely eliminated (Table and Figure H.2, Appendix H) there is still a significant difference between Above-average and Below-average groups only, but the probability has increased ($p < .05$). In all cases, the Below-average readers, at each grade level, used significantly more pause time while reading orally, than did the Above-average readers.

There was a significant main effect due to grade, only when word recognition abilities were included in the data (Table H.3). The Grade two children used significantly more pause time than did the Grade three children. Because this difference (Grade 2 $\overline{M}$ = 48.0; Grade 3 $\overline{M}$ = 42.4) occurred only when word recognition was included in the data, it can be presumed that lack of rapid word recognition could be the cause of the Grade two children using more pause time while reading orally.

The Group-Grade interaction revealed in the two methods of analyses (W. R. Controlled and W. R. Out) were the same: the Below-average Grade three children used significantly more pause time than did the Below-average Grade two children. There were no significant differences between any other combinations of group and grade.

It would appear from these data that although the inclusion of word recognition abililities is effective in

discriminating between all three silent reading comprehension groups, the differences between the percentage of pause time used by Above-average readers and that used by Below-average readers, cannot be attributed to differences in their word recognition abilities, since when word recognition abilities were controlled or entirely excluded from the data, there were still significant differences between the means of the Above-average readers and Below-average readers in the percentage of total pause time used while reading orally.

Because the total pausing time was also expressed as the ratio of pause time to total reading time, this difference also cannot be attributed to the amount of material each group was able to read.

This significant difference in the oral reading performance of these two groups of silent readers is especially interesting. It seems probable that there may be a significant difference in the degrees of efficiency of the actual silent reading processes employed by the Above-average and Below-average readers. Since it seems probable that word recognition abilities, and the amount of material read, might be eliminated as possible explanations of why this significant difference occurs between Above-average and Below-average readers, it may be that the pausing variable - percentage of reading time spent in pausing - is an indication that these two groups of silent readers are

using two different degrees of efficiency in their reading processes, and that the process used by the Below-average readers is much less effective in enabling them to comprehend what they are reading. The Above-average silent reading groups consistently used less pause time while reading orally than did the Below-average silent reading groups.

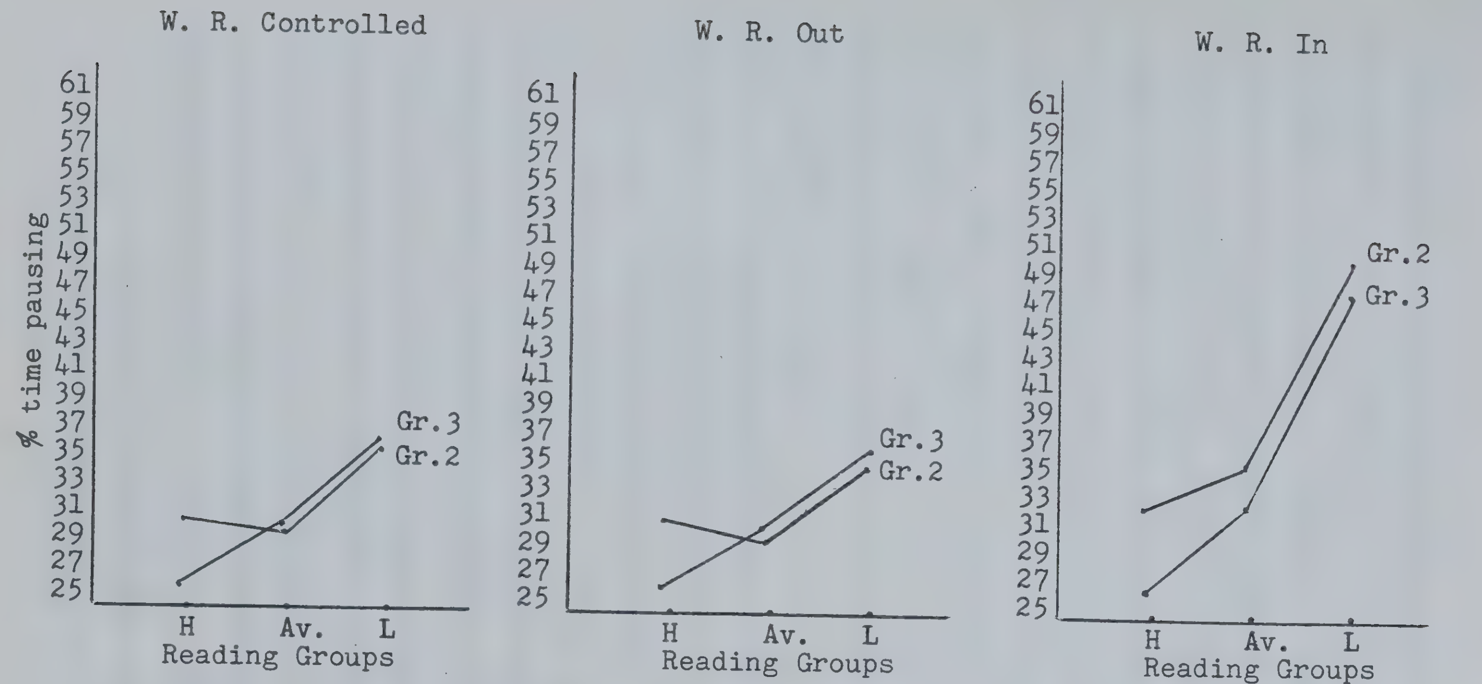
When word recognition was eliminated or controlled, the Grade three Below-average readers used significantly more pause time than did the Below-average Grade two readers, when reading orally. It seems then, that not only are the reading processes of the Below-average silent readers less efficient, but that they become even more inefficient as time goes on. This discrepancy between the Grade three and Grade two Below-average readers cannot be attributed to intelligence since the Grade three Below-average readers had a higher intelligence score mean than did the Grade two Below-average readers, and even higher than the Grade three Average readers (Table 3.3, Chapter III). Neither does it appear that this discrepancy can be attributed to lack of word recognition skills, or to amount of material read.

In summary, then, it seems that children who do not comprehend well what they read silently, are those who spend more time pausing when they are reading orally. Using too much pause time might, then, be considered an inefficient

reading process. This inefficiency also seems to increase for the less able readers as they progress through the grades. Table 3.1, Chapter III indicates that Grade three Below-average readers scored consistently lower on the silent reading tests than did the Grade two Below-average readers. The Grade three Below-average readers also used significantly more pause time, while reading orally, than did the Grade two Below-average readers.

On the first 70 Syntactic Constituents

Figure 4.12 indicates that although the means of the first two criteria (W. R. Controlled and W. R. Out) are similar, the variation within the cells must be greater in the latter case. When effects of word recognition are eliminated, and when the less difficult material is considered, there are no significant differences apparent between groups, grades or sexes, and also no interaction effects. Word recognition abilities seem to play a more important role when only the first 70 syntactic constituents are analyzed (or the less difficult reading material). When word recognition abilities are eliminated over this less difficult material, the pausing variable under consideration cannot even discriminate between the Above-average and Below-average readers, as was the case when the entire oral reading data were analyzed. It seems then that it is the



Significant Sources of Variance:

W. R. Controlled:
Group (p=.001)
Grade-Sex (p=.01)

W. R. Out:
None

W. R. In:
Group (p=.000001)
Grade-Sex (p=.01)

FIGURE 4.12

ANALYSIS OF THE FIRST 70 SYNTACTIC CONSTITUENTS

PERCENTAGE OF READING TIME SPENT IN PAUSING

The data from which these graphs were constructed are found in Appendices G and H.

difficulty of the material read, rather than the amount of the material read, that is able to expose the differences between the two groups. When word recognition abilities are regarded, however, whether these be controlled or included in their entirety, the percentage of reading time spent in pausing can still differentiate between groups of children possessing differing reading abilities, and the probability is much greater in the case of no control at all over word recognition. The Scheffé test, however, could not obtain significance ($p < .05$) between the Above-average and Average groups on this less difficult material, although the probability reached a level of .01 when the differences between Above-average and Below-average groups, and between Average and Below-average groups were considered (see Tables and Figures H.4 and H.6, Appendix H).

An interesting result of the analysis of the first 70 syntactic constituents was that when word recognition abilities were controlled (using the significant pause), there was a significant difference between Average and Below-average readers, which did not occur when the entire oral reading data were considered. The Average readers paused significantly less while reading orally than did the Below-average readers, on this less difficult material, even when word recognition abilities were controlled.

It seems then, that as the reading material becomes

more difficult in syntactic and semantic content, even if the effects due to lack of word recognition are controlled, the Average readers tend to perform similarily to the Below-average readers on this pausing variable. At least, there are no significant differences between the means of the two groups when the ratio of pause time to reading time is considered. However, on the less difficult material, there is a significant difference between the means of the Average readers and Below-average readers on this pausing variable. It seems possible to hypothesize that the Average readers are using different degrees of efficiency in the reading processes for the difficult and less difficult material. Whereas the Below-average readers have not yet been able to adapt their reading processes to the difficulty of the material, the Average readers have not become proficient enough with the more difficult material to significantly differentiate them from the Below-average readers when reading the more difficult material, even when the effects of word recognition are controlled. When word recognition data are eliminated entirely from the data, this difference between Below-average and Average readers is not perceptable as significant, whether they are reading more difficult material or less difficult material.

In analyzing the first 70 syntactic constituents, a Grade-Sex interaction was observed only when word recognition

abilities were controlled or included in the data. When pausing due to lack of word recognition was entirely eliminated from the data, there was no interaction of this kind. See Tables and Figures H.4 and H.5, and Table H.6, in Appendix H. Likewise, there was no Grade-Sex interaction when the entire data were considered using all three criteria for controlling for lack of word recognition abilities (Figure 4.11, p. 103).

Over the first 70 syntactic constituents, there was a significant difference ($p < .05$) between Grade two girls and Grade three girls, with the Grade two girls pausing a much greater percentage of the reading time. There were no other significant differences between any of the other combinations of grade and sex.

Although not significant, it is interesting to note that these Grade two girls paused not only longer than the Grade three girls, but also longer than the Grade two boys and also the Grade three boys (see Tables and Figures H.4 and H.6 mentioned above). Table 3.1, page 63 reveals that these Grade two girls scored higher than any of the other groups on the silent reading comprehension test. However, these same girls also scored the lowest on the Word Recognition Test of any of the other groups (Table H.25, Appendix H). From these observations, it might be stated that silent reading comprehension is not so much dependent on word

recognition ability as it is on the syntactic and semantic difficulty of the material to be read and on the reading processes employed by the child - of which the child's use of the pause may be an important factor.

It is also interesting to note that when the effects of word recognition are eliminated from the data, and when the reading material is relative to grade level (the first 70 syntactic constituents of the Gilmore Oral Reading Test, Form C range from Grade one to Grade three level), that the children in the test sample used approximately the same amount of total reading time for pausing ($\overline{M}$ = 31.5%) as did the fluent adult readers in Goldman-Eisler's experiments ($\overline{M}$ = 30.0%, 1968). Also when data were analyzed without regard to word recognition abilities on these first 70 syntactic constituents, there were no significant differences between reading groups, no significant main effects due to grade or to sex, nor any interactions of any kind.

When word recognition abilities were considered, and all the material the child read included in the data (Figure 4.11), there was a clear differentiation between the silent reading groups, a significant difference between grade levels, and the percentage of pause time used in reading increased considerably ($\overline{M}$ = 46.0%).

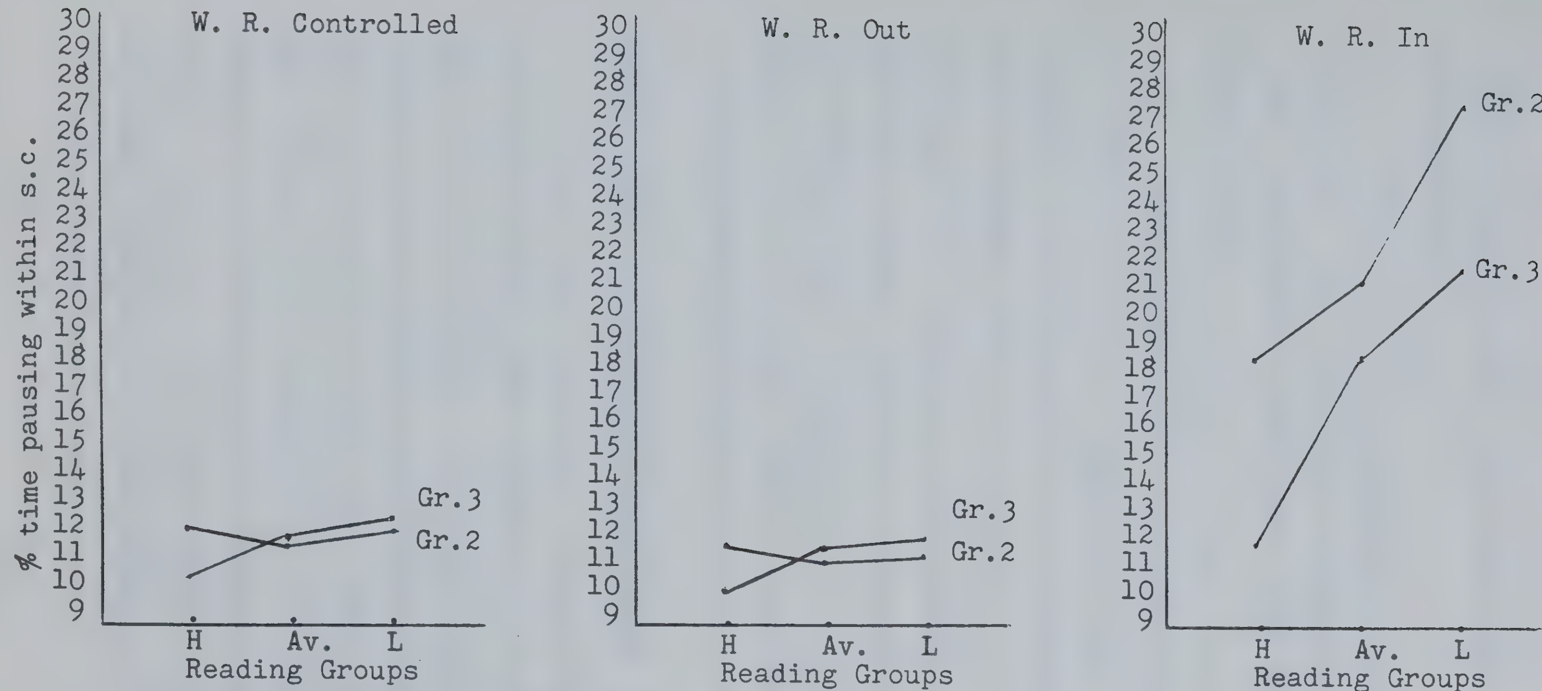
The results of the silent reading test on which the children were grouped into Above-average, Average and Below-

average readers depended to some extent on word recognition abilities and on the increased difficulty of the material to be read. When these two criteria are considered, the percentage of time spent pausing while reading orally clearly differentiates between the three silent reading groups. If these two criteria are ignored, the percentage of time spent pausing while reading orally does not differentiate between Above-average, Average and Below-average silent readers. Therefore, there is a distinct possibility that the children in the test sample did use a reading process, while reading orally increasingly difficult material, which was similar to that which they used while reading the silent reading test.

III. PAUSE TIME WITHIN SYNTACTIC CONSTITUENTS

On entire Oral Reading Material

Figure 4.21 reveals that the percentage of time spent pausing within syntactic constituents while reading orally, only differentiates between silent reading ability groups when word recognition abilities are considered (Groups H - Av., $p < .05$; Groups Av. - L, $p < .05$; Groups H - L, $p < .01$ - see Table H.9, Appendix H). Of the three groups of readers, the Above-average readers spend significantly less time pausing within syntactic constituents. The Below-average readers spend significantly more time pausing within



Significant Sources of Variance:

None

None

Group (p=.002)
Grade (p=.01)

FIGURE 4.21

PERCENTAGE OF READING TIME SPENT IN PAUSING WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices G and H

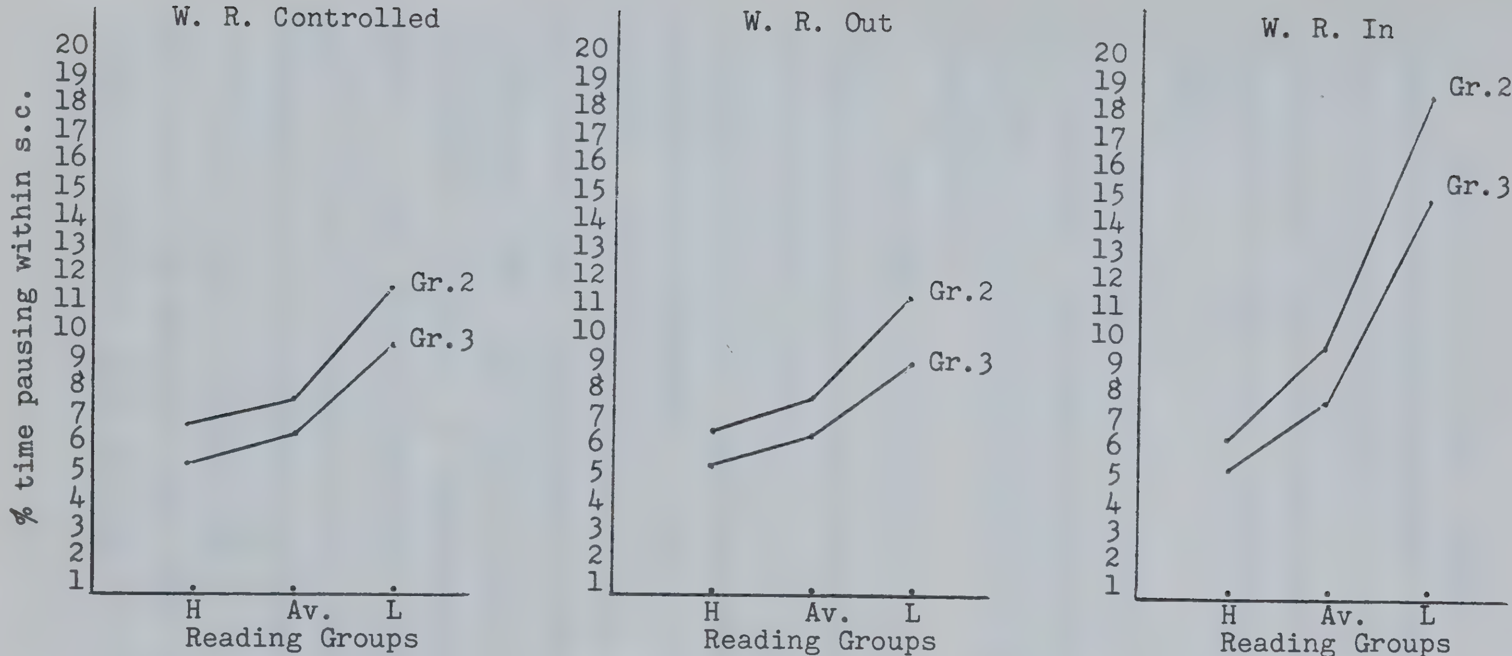
syntactic constituents than either the Average or Above-average groups.

There is also a significant difference between grade levels (p = .01) when this criterion is considered, the Grade two children using more pause time than the Grade three (Grade 2 $\overline{M}$ = 22.3%; Grade 3 $\overline{M}$ = 17.3%).

Since control for, or elimination of word recognition abilities indicate no significant main effects on this variable over the entire oral reading material, it would seem to appear that the percentage of reading time spent pausing within syntactic constituents by the children in this test sample, does not vary among silent reading groups, nor between grade levels, except when the length of pauses within these syntactic constituents which are due to lack of word recognition ability is incorporated into the data.

<u>On the first 70 Syntactic Constituents</u>

Figure 4.22 shows that a significant source of variance using all three criteria, is silent reading group, when the ratio of pause time within syntactic constituents to total reading time is analyzed over the first 70 syntactic constituents of the oral reading test. The Scheffé tests indicate that significant differences ($p < .01$) occur between the Above-average and Below-average groups, and between the Average and Below-average groups, on all of the three criteria (W. R. Controlled, W. R. Out, and W. R.



Significant Sources of Variance:

Group	(p=.008)
Grade	(p=.03)
Grade-Sex	(p=.04)

Group	(p=.01)
Grade	(p=.04)

Group	(p=.00002)
Grade-Sex	(p=.02)

FIGURE 4.22

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

PERCENTAGE OF READING TIME SPENT IN PAUSING WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices G and H.

In). However, on this less difficult material, the percentage of time spent pausing within syntactic constituents fails to differentiate between the Above-average and Average groups, under any of the three conditions (see Table and Figure H.10, Table H.11, and Table and Figure H.12 in Appendix H).

The extremely small value of p (.00002) on the W. R. In criterion, would seem to indicate that word recognition is playing some role when pauses occur within syntactic constituents.

The Grade two children are pausing within syntactic constituents a much greater percentage of the time than are the Grade three, although the differences between grades is only statistically significant when word recognition is controlled or eliminated. This is contrary to the findings when the entire oral reading material was considered. In the latter case, the differences between grades was only significant when lack of word recognition abilities were included in the data. An explanation for W. R. Controlled and W. R. Out showing significant sources of variance between groups and between grades on the least difficult material, whereas no such significance occurred when the entire reading material was considered, is in order. This may be due to the fact that very much less data were eliminated by these two criteria when only the first 70 syntactic consti-

tuents were considered. As the children read progressively on through the entire material, however, the context became more difficult, more words were unrecognized, and hence in Figure 4.21 much more data were eliminated when word recognition was controlled or eliminated. In fact, it is possible that the control or elimination of data was so abundant that the variance in the data became smaller to such an extent that no significant differences appeared in the Analysis of Variance.

The interaction between Grade and Sex on the two criteria, W. R. Controlled and W. R. In, indicates that Grade two girls are pausing significantly longer within syntactic constituents than are Grade three girls, while the means for the Grades two and three boys are almost identical (see Tables and Figures H.10 and H.12, Appendix H). When word recognition is controlled, the Grade two girls are also pausing within syntactic constituents significantly longer than Grade two boys and Grade three boys. Although this same phenomenon occurs when the effects of word recognition are included in the data, the differences are not statistically significant.

It is entirely possible that this Grade-Sex interaction which keeps occurring in the data could be due to some kind of aberrant sample. However, since Sex, as a variable, was included only as an equalizing factor in the

selection of the sample, this deviation (if, in fact, it is present) can be tolerated by the investigator.

In summary, it might be said that regardless of whether the material read orally is relatively difficult or not, when word recognition abilities are considered, the percentage of reading time spent pausing within syntactic constituents significantly differentiates between reading groups, but on the less difficult material there is no significant difference between the means of the Above-average and Average silent readers, when this oral reading pausing variable is considered. However, the means of the Above-average readers always indicate that they are not pausing as long within syntactic constituents as the Average readers are. The Average readers are not pausing as long within syntactic constituents as the Below-average readers are. When word recognition abilities are controlled or eliminated, the trend still exists for the less difficult material, indicating that there may be something in the reading processes of these three different groups which is causing this to happen. However, when word recognition is controlled or eliminated over the entire oral reading material, although the Grade three children still follow this trend - that is, the better readers using the shortest pause time within syntactic constituents - the Grade two groups of Above-average, Average and Below-average readers, tend to have

almost identical means. It seems that lack of word recognition abilities may be causing the Grade two children to slow down within syntactic constituents, to such an extent that they cannot group the words within a syntactic constituent with effective cohesiveness, and are forced to use a less efficient variation of the reading process than that which they used on the less difficult oral reading material, (or the first 70 syntactic constituents).

IV. NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS

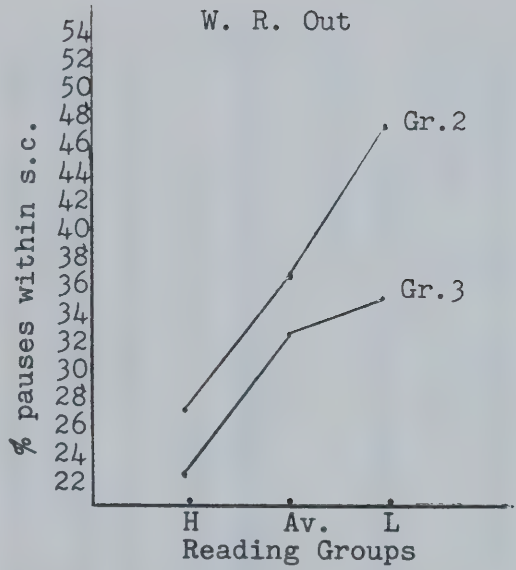
The measurement of the number of pauses made within syntactic constituents did not vary for the two criteria W. R. Controlled and W. R. In. That is, when these measurements were made, the same number of pauses were counted. (It was the length of the pause which varied). Therefore, only the W. R. In and the W. R. Out criteria need to be considered in discussing this variable.

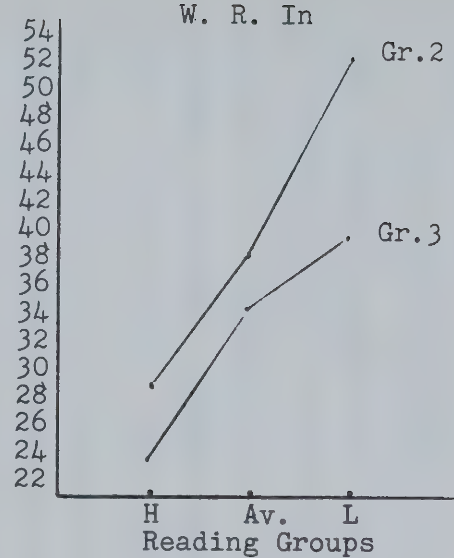
When the entire oral reading material is considered, the variable is discussed in terms of the ratio of number of pauses made within syntactic constituents to the number of opportunities to pause within syntactic constituents. However, for the analysis of the first 70 syntactic constituents, no ratios were needed, as the number of opportunities to pause within syntactic constituents remained constant for

each child in the sample.

<u>On entire Oral Reading Material</u>

Figure 4.31 indicates that when word recognition skills were not considered, the ratio of number of pauses within syntactic constituents to number of opportunities to pause within syntactic constituents, significantly discriminated between some silent reading groups (Groups H - Av., $p < .01$; Groups H - L, $p < .01$. See Table H.14, Appendix H). But there was no significant difference between Average readers and Below-average readers. The Table of Means in Appendix H (Table H.14) indicates that the Above-average readers, at both grade levels, always paused fewer times within syntactic constituents than did the Average, or Below-average readers. Similarily, the Average readers always paused fewer times within syntactic constituents than did the Below-average readers. However, the difference between the means of the number of pauses made within syntactic constituents by Average and Below-average readers did not reach significance, which indicated that these two groups of silent readers were more similar on this pausing variable. When lack of word recognition skill is completely eliminated from the entire data, this is the only pausing variable - number of pauses within syntactic constituents - that can significantly discriminate between Above-average and Average





Significant Sources of Variance:

W. R. Out:
Group (p=.01)
Grade (p=.01)

W. R. In:
Group (p=.002)
Grade (p=.01)

FIGURE 4.31

RATIO: NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS TO NUMBER OF OPPORTUNITIES TO PAUSE WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices G and H.

readers. Above-average readers pause much fewer times within syntactic constituents than do either of the other silent reading groups.

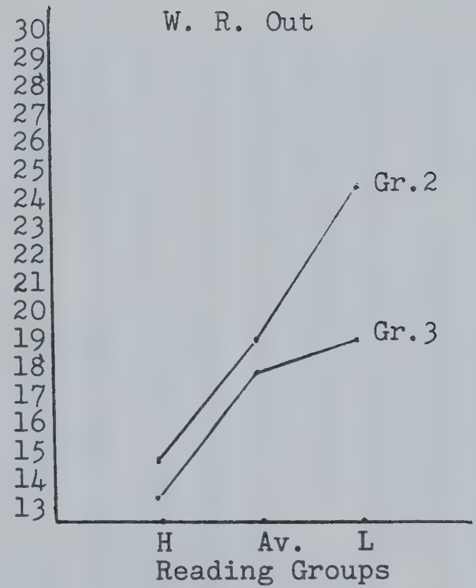
When number of pauses due to lack of word recognition were included in the data, then there were significant differences ($p < .01$) between all three groups (Table H.15, Appendix H). Below-average silent readers always made the largest percentage of pauses within syntactic constituents, while reading orally. Above-average silent readers always made the smallest percentage of pauses within syntactic constituents, while reading orally.

The percentage of pauses within syntactic constituents significantly discriminated between grade levels ($p=.01$) with both criteria (W. R. Out and W. R. In). The Grade two children always made a significantly greater percentage of pauses than did the Grade three (Grade 2 $\overline{M}$ = 37.3, 39.6; Grade 3 $\overline{M}$ = 29.7, 32.5).

There were no interaction effects of any kind of this variable.

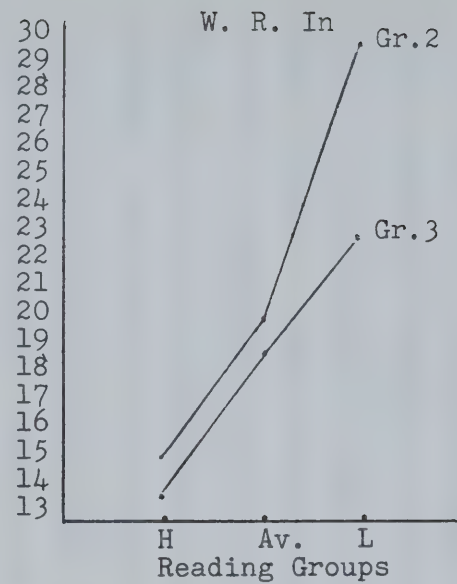
<u>On the first 70 Syntactic Constituents</u>

An analysis of the material read in common by all ability groups (Figure 4.32), when the number of pauses due to lack of word recognition were eliminated from the data,indicates that the number of pauses made within syntactic constituents does not significantly discriminate



Significant Sources of Variance:

None



Group (p=.01)
Grade (p=.03)

FIGURE 4.32

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices G and H.

between Above-average, Average, and Below-average readers. Neither does this analysis discriminate between grade levels, nor were there any significant interactions. Table H.17, Appendix H, does indicate that when the effects of lack of word recognition abilities are removed from the data, the Above-average readers pause less often within syntactic constituents than do the Average, and the Average readers pause less often than the Below-average. In addition, the mean for the Grade two children indicates that they pause more often within syntactic constituents while reading orally, than do the Grade three children (Grade two $\overline{M} = 19.2$; Grade three $\overline{M} = 16.6$). However, none of these differences were statistically significant.

When pauses due to lack of word recognition ability were included in the data, the number of pauses made within syntactic constituents significantly discriminated between Above-average and Below-average groups, and between Average and Below-average groups ($p < .01$), but not between Above-average and Average groups, even though the mean number of pauses for the Above-average group was less than that for the Average group (see Table H.18, Appendix H). The Above-average and Average readers seem to read the less difficult material with no significant variation in the number of pauses made within syntactic constituents, while the Below-average readers pause much more frequently within syntactic constituents.

When pauses due to lack of word recognition were observed, there was also a significant difference between grade levels ($p = .03$), the Grade two children making significantly more pauses within syntactic constituents than did the Grade three children (Grade 2 $\overline{M} = 21.4$; Grade 3 $\overline{M} = 18.2$).

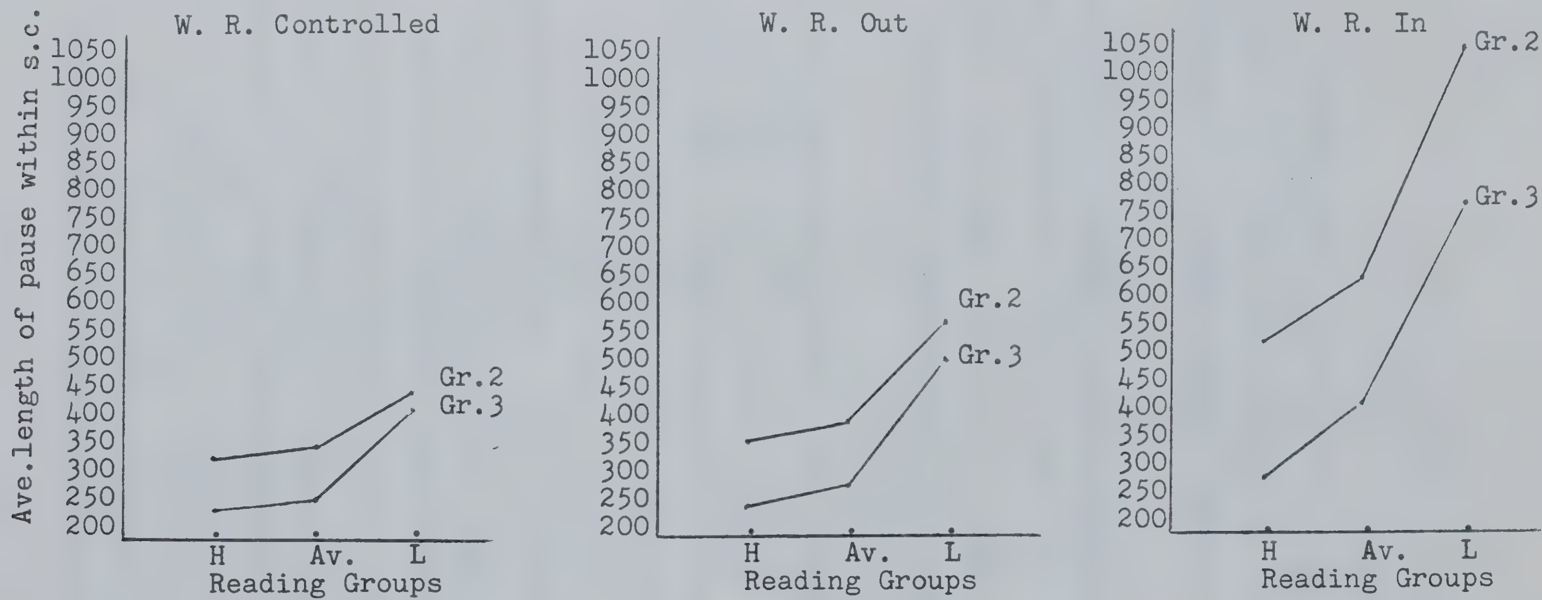
In summary, when the entire oral reading material is considered, the number of pauses made within syntactic constituents while reading orally, seems to be the pausing variable that discriminates most consistently between the silent reading groups and between the grade levels, in a clear-cut manner, with no interaction effects. Above-average readers do not pause as often within syntactic constituents as do Average readers, and Average readers do not pause as often within syntactic constituents as the Below-average readers do. Grade two children pause more often within syntactic constituents than do the Grade three children. Only on the less difficult material (first 70 syntactic constituents), when effects due to lack of word recognition abilities were ignored, did this consistency fail to operate. When the effects of word recognition were included, even the data on the less difficult material followed the same pattern as that on the entire test data.

V. AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT

On entire Oral Reading Material

Figure 4.41 indicates that using the criterion W. R. In, the average length of the pause within syntactic constituents does not significantly discriminate between Above-average, Average and Below-average readers. There is a significant difference, however, ($p=.01$) between grade levels. Grade two children pause much longer within syntactic constituents than do grade three children (Grade 2 $\overline{M}$ = 732.4 msec; Grade 3 $\overline{M}$ = 478.2 msec.).

When word recognition abilities are controlled or ignored completely, not only is there a significant difference between grade levels ($p = .01$), but there are also significant differences, using either criteria, between Above-average and Below-average groups ($p < .01$), and between Average and Below-average groups ($p < .01$). There is, however, no significant difference between the average length of pause within syntactic constituents, when this variable is contrasted for Above-average and Average silent readers. The Above-average and Average readers use significantly shorter average lengths of pauses within syntactic constituents than do the Below-average readers (see Tables and Figures H.19 and H.20, Appendix H).



Significant Sources of Variance:

W. R. Controlled		W. R. Out		W. R. In	
Group	(p=.00001)	Group	(p=.000001)	Grade	(p=.01)
Grade	(p=.01)	Grade	(p=.01)		
Grade-Sex	(p=.02)	Grade-Sex	(p=.01)		

FIGURE 4.41

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT MEASURED IN MILLISECONDS

The data from which these graphs are constructed are found in Appendices G and H.

Again, a significant Grade-Sex interaction occurs in the data. This interaction is apparent using the criteria W. R. Controlled and W. R. Out. The tests of significance for these interactions, when word recognition abilities are controlled reveal that the Grade two girls' average length of pause within syntactic constituents is significantly longer than that of the Grade three girls ($p < .01$), also longer than the Grade two boys' ($p < .01$), and the Grade three boys' ($p < .05$). The information on this interaction effect is shown in Table and Figure H.19, Appendix H. This same interaction occurrs when word recognition abilities are eliminated from the data, but the level of significance becomes smaller ($p < .01$) when the Grade two girls and Grade three boys are contrasted (see Table and Figure H.20, Appendix H).

There are no significant differences, using either criteria, between the means of the Grade three boys, Grade three girls, and Grade two boys. In fact, the means of the average length of their pauses within syntactic constituents, are very similar.

The interaction graphs indicate that it is probably the significantly higher Grade two girls' mean score that is the cause of the significant main effects due to Grade in the Analyses of Variance.

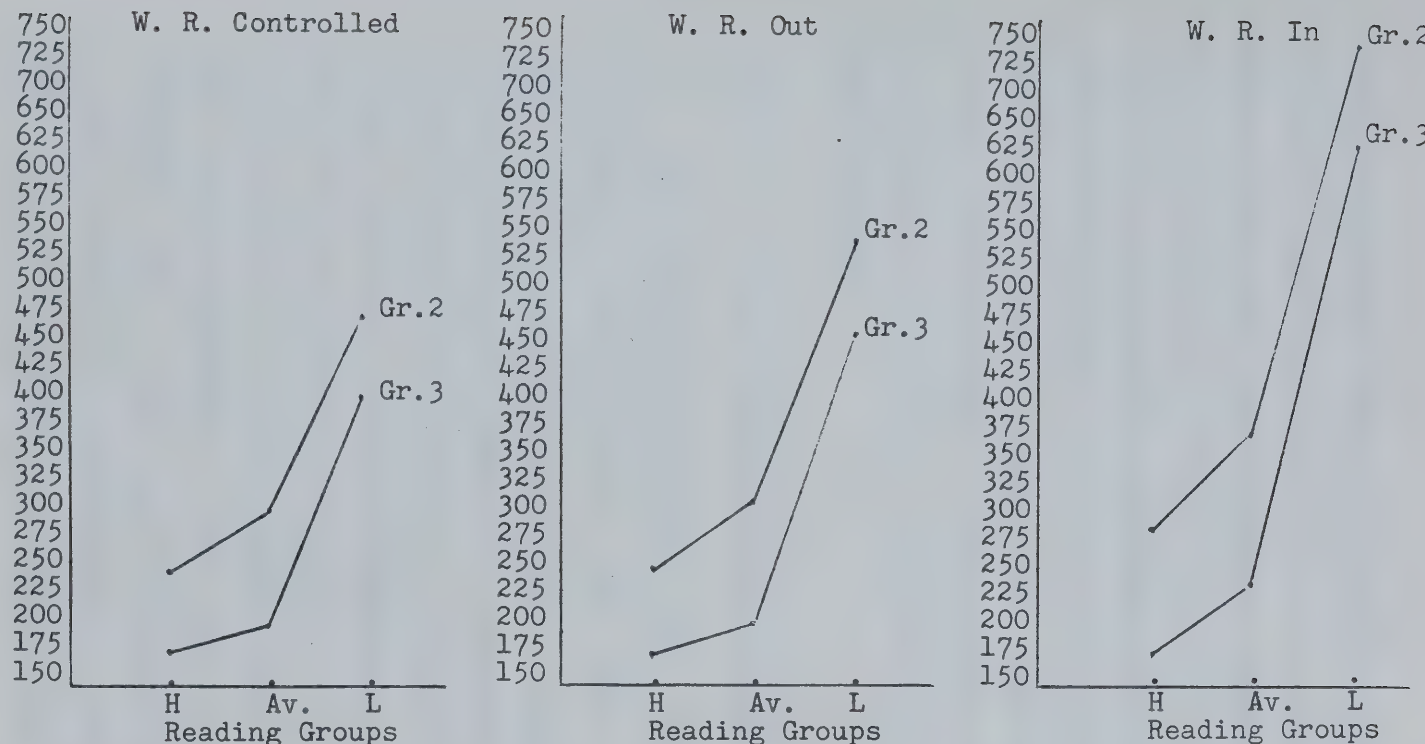
On the first 70 Syntactic Constituents

Examination of the Scheffé tests of significance and the interaction graphs in Appendix H (Tables and Figures H.22, H.23 and Table H.24), plus a perusal of Figure 4.42, reveal the same results for this variable whether the entire test data are analyzed, or only the first 70 syntactic constituents are considered. The one exception is that there is no significant difference between grades when word recognition data are included in the analyses.

To summarize, it can be stated that the mean length of pause within syntactic constituent for the Grade two children, in all three groups, is always longer than the means of the Grade three children in comparable groups, whether word recognition abilities are controlled, eliminated, or included in the data, and whether the entire oral reading material is analyzed, or only the first 70 syntactic constituents.

Lack of word recognition abilities, on the entire oral reading material, do not account for this difference. On the less difficult material, word recognition abilities seem to play some role, although all three groups of Grade two children still have much longer mean average pauses within syntactic constituents than do the Grade three.

A perusal of Figures 4.41 and 4.42 also reveal that the average length of pause within syntactic constituent of



Significant Sources of Variance:

Group	(p=.000001)	Group	(p=.000001)	None	
Grade	(p=.01)	Grade	(p=.01)		
Grade-Sex	(p=.02)	Grade-Sex	(p=.04)		

FIGURE 4.42

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices G and H.

the Below-average readers, at each grade level, is always very much longer than that of the Above-average and Average readers, even when word recognition effects are eliminated, and even on the less difficult material. Since this difference in the oral reading performance of the Below-average silent readers seems to be consistent, it is possible that this type of reader is using a much less efficient reading process than the Average or Above-average child, and that this process is very much involved with how the child is using the pause.

VI. SUMMARY AND CONCLUSIONS

All the pausing variables used in this study: percentage of total reading time spent in pausing, time spent pausing within syntactic constituents, number of pauses made within syntactic constituents, and average length of pause within syntactic constituent, were, under various conditions, able to discriminate significantly among the silent reading groups used in the sample. Since the measurements of these variables were obtained from the oral reading performance of the same test sample, the assumption that at least some of the reading processes used by young children when reading orally, may be similar to those they use when reading silently, can be upheld.

It also seems, from the data presented in this chapter, that word recognition abilities may not play as important a role in these reading processes as is often attributed to them. Even when the effects of word recognition were controlled or entirely eliminated from the data, many of the pausing variables were still able to discriminate between silent reading groups.

In the test sample, the trend was that the better silent readers and the older children tended to read a syntactic constituent as a whole, when they read orally, using less pause time and fewer number of pauses within the syntactic constituent. They seemed to be using the pause effectively to increase comprehension. However, the Group-Grade interactions when word recognition was controlled and eliminated, indicated a significant disruption in this trend. The Below-average Grade three readers were using significantly more pause time when reading orally than were the Grade two Below-average readers. Table 3.1, Chapter III, reveals that the Below-average Grade three children also obtained mean standard scores on the silent reading test which were lower than those of the Below-average Grade two children. Table 3.3, page 66, also indicates that these Below-average Grade three children had slightly higher intelligence quotients than did the Below-average Grade two children. Table H.25 (Appendix H) also

discloses that the Below-average Grade three children obtained a mean score on the Word Recognition Test which was higher than that obtained by the Grade two Below-average readers. Factors other than word recognition ability and intelligence seem to be causing this discrepancy in the Below-average silent reading groups at the two grade levels. As these children progress from Grade two to Grade three, it seems that their silent reading abilities deteriorate and their use of the pause in oral reading becomes less efficient. It is feasible not only that there is a relationship between the silent and oral reading processes of these children, but also that the actual pausing phenomena used by these Below-average children are causing them difficulty in reading.

CHAPTER V

FINDINGS: THE RELATIONSHIPS BETWEEN ORAL AND SILENT READING COMPREHENSION SCORES AND VARIOUS PAUSE VARIABLES

I. INTRODUCTION

Although Chapter V is primarily concerned with Hypotheses five, six, seven and eight -- the relationship between oral reading comprehension scores and the four pausing variables used in this study -- these relationships could not be investigated in a comprehensive manner without first making some attempt to compare and contrast the oral reading comprehension scores, and the silent reading comprehension scores, obtained by the children in this test sample.

In this chapter it is necessary to keep in mind the distinction between the reading processes the child may be using while reading silently or orally (as the case may be), and the comprehension scores that he may obtain on a silent or oral reading comprehension test. Chapter IV data seems to indicate the possibility of young children using similar oral and silent reading processes, at least to the extent that the manifestation of the pause in oral reading (as an indication of an aspect of process, or how the child may be organizing visual input) is able to discriminate significantly between silent reading comprehension groups of varying abilities. How children comprehend what they read, however, although certainly the most important product of these reading processes, is not synonomous with them. Chapter IV was primarily concerned with analyzing the "process" in so far

as this process was indicated by the pausing phenomena. Chapter V will be more concerned with the "product", in terms of the comprehension scores on the silent and oral reading tests.

The first part of this chapter deals with the relationship between the oral reading comprehension scores and the silent reading comprehension scores of the children in the test sample, and in addition, tabulates the distribution of the oral reading comprehension scores in terms of the three silent reading groups composing the study. Throughout this discussion, it must be kept in mind that comprehension as measured by the Gilmore Oral Reading Test, Form C relies on the child's ability to recall information and verbalize it, whereas the Gates-MacGinitie Reading Test, Form 1 tests comprehension by the use of multiple choice questions. In this silent reading test there is not the same degree of memory involved, nor is there a necessity to verbalize the answer. Although the very nature of the tests themselves would, no doubt, influence the comprehension scores obtained, nevertheless, the results are very interesting.

The latter part of this chapter is concerned with whether the various pausing phenomena used by the child in oral reading, differentiates between three groups of readers -- those with high, average and low comprehension scores -- when these groups are determined by the oral reading comprehension scores (rather than the silent reading comprehension scores which were used to differentiate the groups in Chapter IV). When groups are differentiated by

oral reading comprehension scores, they are designated as "First", "Second", and "Third" group, to distinguish them from the Above-average, Average and Below-average readers, grouped according to silent reading comprehension scores. The method by which the First, Second and Third groups were determined was explained in Chapter III.

Correlation programs, and Analysis of Variance programs were used to obtain the data presented in this chapter. The correlation coefficients were determined, using the control for word recognition abilities built into the design of the study, and also explained in Chapter III. These correlation coefficients are tabulated in Appendix I. Appendix J contains the data obtained from the three-way Analysis of Variance, grouping according to oral reading comprehension scores, grade and sex. Factors A, B and C are oral reading group, grade and sex, respectively. Tables of means and Scheffé tests of significance between means, and on interaction effects,are found in Appendix K.

II. RELATIONSHIP BETWEEN ORAL AND SILENT READING COMPREHENSION SCORES

Oral Reading Comprehension Scores

The means of the oral reading comprehension scores, when the children were grouped into First, Second and Third group, according to their scores on the oral reading compre-

hension test, as shown in Table 5.1.

TABLE 5.1

MEANS OF ORAL READING COMPREHENSION SCORES BY ORAL READING GROUPS

Gr.	Oral Reading Group	Boys Mean	Boys n	Girls Mean	Girls n	Total Mean	Total n	Range
2	First	77.5	4	67.3	8	70.7	12	63-83
	Second	55.6	5	56.1	7	55.9	12	48-63
	Third	38.2	9	27.0	3	35.4	12	17-46
		Grade Two Grand Mean				54.0		
3	First	73.8	6	72.3	6	73.1	12	63-90
	Second	57.0	6	58.5	6	57.8	12	52.63
	Third	44.2	6	33.5	6	38.8	12	23-50
		Grade Three Grand Mean				56.6		

The total mean score for Grade two is 54.0, and that for Grade three is 56.6. This table reveals very similar total means at each grade level when First, Second and Third groups are considered, although on the whole, the Grade three children obtained slightly higher oral reading comprehension scores. The Grade three ranges of scores were also slightly higher than the Grade two ranges, but there were no large discrepancies between the grades when the groups were considered. That is, the mean of the First group in Grade

two was similar to the mean of the First group in Grade three, and similarily with the other two groups.

The most significant observation in Table 5.1 is the unequal n's at the Grade two level. Eight of the twelve children in the First group in Grade two were girls, while nine of the twelve in the Third group at this grade level, were boys. At the Grade two level, the girls far surpassed the boys when grouped according to oral reading comprehension scores. At the Grade three level, the n's were equal for each sex, which seems to indicate that sex differences disappear with increasing grade level, at least when oral reading comprehension scores are considered.

Oral Reading Comprehension Scores by Silent Reading Group

Table 5.2 tabulates the number of Above-average, Average and Below-average silent readers at each grade level, who fell within certain ranges in the oral reading comprehension test.

When silent reading comprehension groups were ranged according to oral reading comprehension abilities, the largest number of children fell within the 51 - 60 per cent score range. Since the distribution of silent reading

TABLE 5.2

ORAL READING COMPREHENSION SCORES BY SILENT READING GROUP

Range of Oral Reading Scores	Grade 2 Silent Read. Groups Ab.Av.	Av.	Be.Av.		n	Grade 3 Silent Read. Groups Ab.Av.	Av.	Be.Av.		n
10 - 20	1	0	1	=	2	0	0	0	=	0
21 - 30	0	0	1	=	1	0	0	2	=	2
31 - 40	1	2	2	=	5	2	2	1	=	5
41 - 50	3	2	2	=	7	2	2	0	=	4
51 - 60	3	2	4	=	9	4	5	2	=	11
61 - 70	1	4	2	=	7	3	2	3	=	8
71 - 80	1	2	0	=	3	1	1	3	=	5
81 - 90	2	0	0	=	2	0	0	1	=	1
91 -100	0	0	0	=	0	0	0	0	=	0
Totals	12	12	12		36	12	12	12		36

scores for these children was approximately rectangular, there was a regression toward the oral reading mean by the children in the silent reading groups. This phenomenon always occurs when the correlation coefficient between the two variables being compared is less than one. In this instance, correlation coefficients between silent reading comprehension scores and oral reading comprehension scores at each grade level, and for the total group, did not reach significance ($p \leq .05$). The highest relationship occurred at the Grade two level, where the correlation

coefficient between the two sets of scores was .314 ($p=.06$). At the Grade three level, the correlation coefficient was not significant ($r= -0.055$). For the total sample there was also no significant correlation ($r=0.108$).

Comparison of Oral and Silent Reading Means

The means of the oral reading comprehension scores, when the children were grouped into Above-average, Average and Below-average readers, according to silent reading comprehension scores, are shown in Table 5.3. This table reveals very similar means for all three groups, at both grade levels, and for both boys and girls.

TABLE 5.3

MEANS OF ORAL READING COMPREHENSION SCORES BY SILENT READING GROUP

Grade	Silent Reading Group	Oral Reading Comprehension Scores		
		Boys	Girls	Total
2	Above-average	59.3	56.0	57.6
	Average	55.8	58.0	56.9
	Below-average	40.2	54.7	47.4
3	Above-average	52.5	59.3	55.9
	Average	58.5	50.8	54.7
	Below-average	64.0	54.7	59.1

A three-way Analysis of Variance on the oral reading comprehension score variable, when children were grouped

according to silent reading comprehension ability, revealed no significant main effects due to group, grade or sex, nor were there any interaction effects. (See Appendix G, Variable 25).

Table 5.3 also indicates, that for the total sample, the Grade two Below-average boys obtained the lowest mean -- 40.2 per cent, which might be expected. But the surprising result is that the Grade three Below-average boys (grouped according to silent reading ability) were able to obtain the highest mean of all the groups on the oral reading comprehension score -- 64.0 per cent. This score was higher than any of the Above-average or Average means at either grade level. Since the Grade three Below-average girls also scored higher than the Average Grade three girls, when the total groups were considered, the Grade three Below-average readers comprehended material which they read orally, much better than did any other group. In addition, the Grade two Above-average and Average readers scored higher than did the Grade three Above-average and Average readers. For the younger children, and the Below-average older children, oral reading of the material seemed to produce higher comprehension scores.

An additional three-way Analysis of Variance on the silent reading comprehension score variable, when children were grouped according to oral reading comprehension ability (see Table 5.4 and Appendix J, Variable 25) also revealed no significant main effects due to oral reading group, grade

TABLE 5.4

MEANS OF SILENT READING COMPREHENSION
SCORES BY ORAL READING GROUPS

Grade	Oral Reading Group	Silent Reading Comprehension Scores		
		Boys	Girls	Total
2	First	62.8	59.3	60.5
	Second	54.4	55.1	54.8
	Third	54.8	56.0	55.1
3	First	47.3	53.8	50.6
	Second	59.8	58.6	59.3
	Third	56.5	53.0	54.8

or sex. However, there was a significant interaction effect ($p=.03$) between Group and Grade. Results of the Scheffé test of significance (see Appendix K, Figure K.25) revealed that the First group of oral readers in Grade two comprehended material read silently significantly better than did the First group in Grade three ($p<.05$). In addition, there was a significant difference ($p<.05$) between the First and Second groups in Grade three, which indicated that the Second oral reading group in that grade comprehended silently significantly better than did the First oral reading group.

Table 5.4 indicates that at the Grade two level, the means of the silent reading scores tended to decrease from First group to Third group (although the means for

the Second and Third groups were almost identical), which indicates that for these children, the comprehension of oral and silent reading may be in some way similar. At the Grade three level, however, the mean of the First group on silent reading scores was the lowest of the three groups in that grade, and the difference between the Second and Third groups was also more pronounced, but not significantly different (see Appendix K, Figure K.25). There seems to be no similar relationship between silent and oral reading comprehension skills at this grade level.

III. ORAL READING GROUPS AND PAUSING VARIABLES

In this section an attempt will be made to analyze the relationship between oral reading comprehension and the four pausing variables used in this study -- the percentage of total reading time spent in pausing, the percentage of time spent in pausing within syntactic constituents, the actual number of pauses made within syntactic constituents, and the average length of the pause within syntactic constituents.

These four variables are analyzed using the same three criteria used in Chapter IV, when the sample was grouped according to silent reading comprehension scores. That is 1) controlling for word recognition abilities (W. R. Controlled), 2) removing all effects due to lack of word recognition abilities (W. R. Out), and 3) leaving the

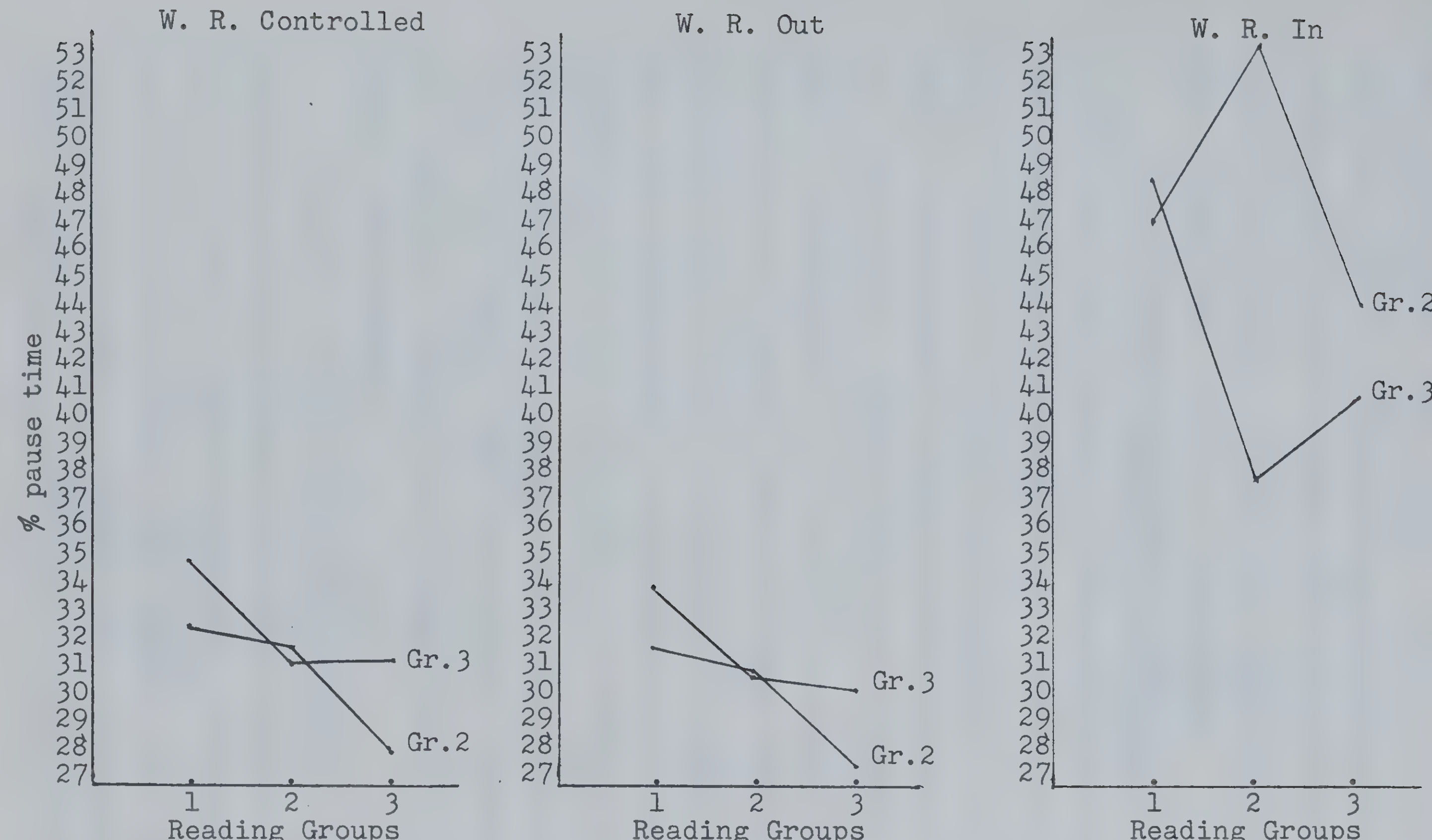
data intact which included the number and length of pauses due to lack of word recognition abilities (W. R. In).

Similarily, as in Chapter IV, (where the children were grouped according to silent reading comprehension scores), this section, grouping according to oral reading comprehension scores, is concerned not only with the data on the entire reading material, but also with the data on the first 70 syntactic constituents, which were read in common by all the children.

A. Percentage of Total Reading Time Spent in Pausing

On entire Oral Reading Material: There is no significant relationship at any grade level, nor for the entire group, between oral reading comprehension scores and the percentage of time spent pausing, while reading orally (Gr.2 r= 0.257; Gr.3 r= 0.201; Total r= 0.225).

Figure 5.11 indicates that whether lack of word recognition abilities are controlled, eliminated, or included in the data, the Analysis of Variance revealed that percentage of total pause time while reading orally,did not significantly discriminate between any of the oral reading groups, nor between the sexes. When word recognition abilities, however, were considered, the percentage of actual reading time spent in pausing did differentiate between grades (p=.01). The Grade two children spent significantly more time pausing than did the Grade three



Significant Sources of Variance:
None

None

Grade (p = .01)

FIGURE 5.11

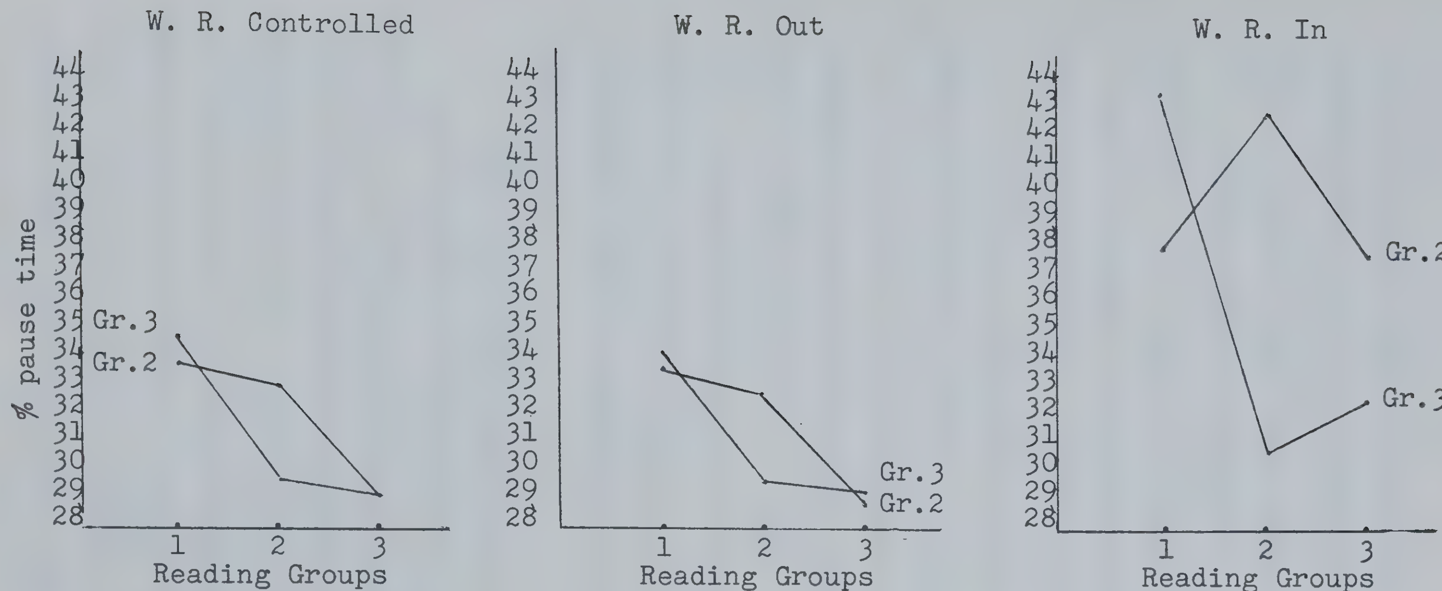
PERCENTAGE OF TOTAL TIME SPENT IN PAUSING

The data from which these graphs were constructed are found in Appendices J and K.

children (Gr.2 $\overline{M} = 48.0$; Gr.3 $\overline{M} = 42.2$). It would seem that the inability of the Grade two children to recognize a word quickly was the cause of this significant difference between the two grades, since this significant difference only occurred with the W. R. In criterion.

On the first 70 Syntactic Constituents: Correlation coefficients (see Appendix I) revealed no significant relationship at the Grade two level, nor for the total group, between oral reading comprehension scores and time spent in pausing while reading orally the first 70 syntactic constituents. However, there was a significant ($p = .05$) but low relationship ($r = 0.327$) at the Grade three level. Pausing in oral reading could be a skill which children gradually learn to use to help them to comprehend what they are reading orally. That there was no significant relationship at the lower grade level between percentage of pausing time used in reading orally and oral reading comprehension, may indicate that these younger children have not yet learned to control this linguistic device to assist them in comprehending.

Figure 5.12 shows that the Analysis of Variance on this pausing variable over the first 70 syntactic constituents, indicated a Grade-Sex interaction when word recognition abilities were controlled. The Scheffé test of significance on this BC interaction revealed that the Grade two girls paused significantly more ($p < .05$) than did the Grade three



Significant Sources of Variance:

W. R. Controlled: Grade-Sex (p=.02)

W. R. Out: None

W. R. In:
Group (p=.02)
Group-Grade (p=.02)
Grade-Sex (p=.02)

FIGURE 5.12

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS
PERCENTAGE OF READING TIME SPENT IN PAUSING

The data from which these graphs are constructed are found in Appendices J and K.

girls (Gr.2 $\overline{M}$= 33.8; Gr.3 $\overline{M}$= 28.9). There were no other significant differences related to this interaction effect (see Appendix K, Table and Figure K.10).

When word recognition abilities were completely eliminated from the data (Figure 5.12), the Analysis of Variance indicated no significant main effect due to group, grade or sex, and also no significant interaction.

When word recognition data were included in the analysis, however, the three groups were differentiated at the .02 level of significance, there was a significant interaction between Group and Grade ($p = .02$) and also between Grade and Sex ($p = .02$).

It would seem that word recognition ability is the determining factor in differentiating the three oral reading groups when the percentage of time spent in pausing is considered.

The significant main effect due to group (Figure 5.12, $p = .02$) which the three-way Analysis of Variance revealed, failed to differentiate between the groups when the Scheffé test of significance was applied to the various combinations. Although there is a significant difference somewhere within the three groups, it is not sufficiently strong enough to appear when the stringent Scheffé test is applied to the data. It is interesting to note, however, that the First group of oral readers used more pause time than did those

children who comprehended less well when reading orally.

The Scheffé test for Group-Grade interaction differentiated ($p < .05$) the Second group in Grade two from the Second group in Grade three (Grade 2 $\overline{M} = 42.5$; Grade 3 $\overline{M} = 30.4$). Grade two children used significantly more pause time than did the Grade three children, in these comparable groups. There was no such effect when word recognition abilities were eliminated or controlled. It may be that the younger children tend to use more pause time while reading orally because of failure to recognize words quickly. The First and Third groups, at the Grade two level, used about the same amount of pause time. But at the Grade three level, such does not seem to be the case. Those children in Grade three who comprehended the oral reading material better, used the longest pause time, while the Third group used a much shorter amount of pause time. The Grade two use of the pause, and the Grade three use of the pause seem to be different.

The Grade-Sex interaction, when word recognition abilities were included in the data (see Appendix K, Table and Figure K.6) indicates that Grade two girls used significantly more pause time ($p < .05$) than did the Grade two boys (Girls $\overline{M} = 42.6$; Boys $\overline{M} = 35.8$). It is interesting to note from Table 5.1 that the Grade two girls in the First group of oral readers outnumbered the boys two to one. At the Grade two level, then, when oral reading comprehension is considered, it seems that the girls (who also

comprised most of the First group when the children were divided on the basis of oral reading comprehension scores), are using the longer pause time. This result is contrary to the findings obtained in Chapter IV. When silent reading data were analyzed, it was the children who comprehended better who used less pause time while reading orally.

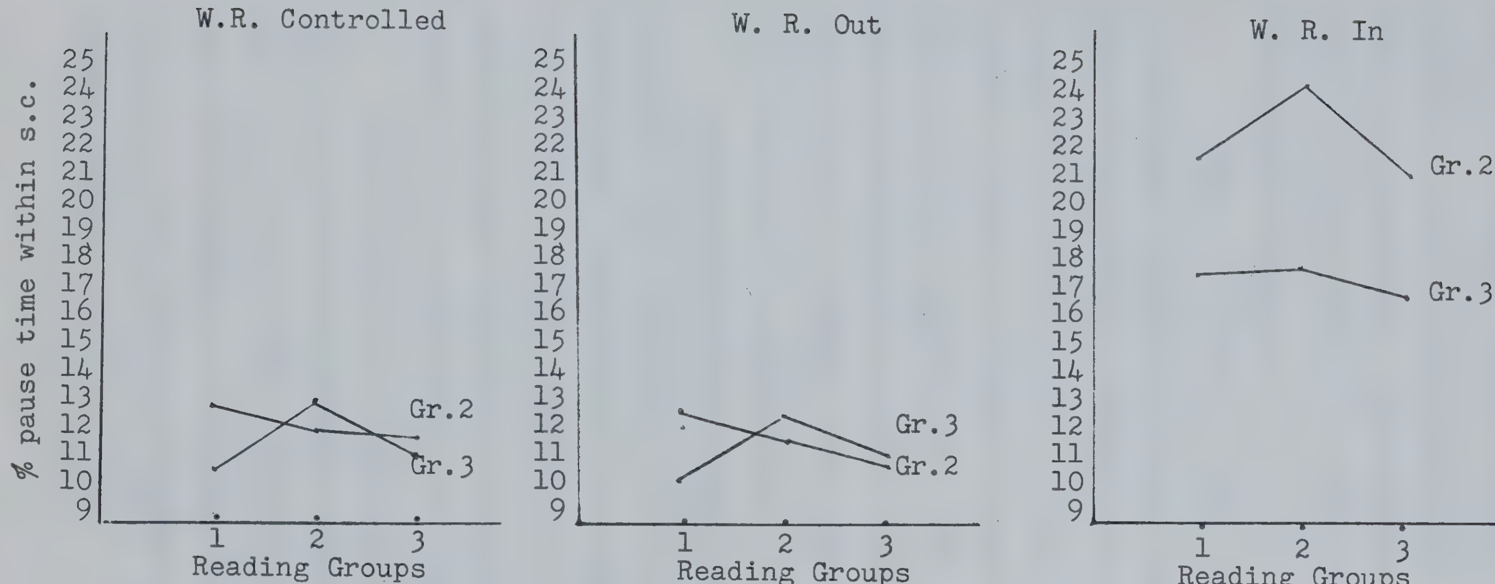
The Grade-Sex interaction also revealed a significant difference ($p < .05$) between Grade two girls and Grade three girls. The younger girls used significantly more pause time (Grade 2 $\overline{M} = 42.6$; Grade 3 $\overline{M} = 32.5$).

Since word recognition abilities must be included or controlled to obtain a Grade-Sex interaction effect, it may be that the younger children need more time to recognize the word. However, there were no significant differences, using these criteria, when the Grade two and Grade three boys were observed.

B. <u>Pause Time Within Syntactic Constituents</u>

<u>On entire Oral Reading Material</u>: There is no significant relationship, at any grade level, nor for the entire group, between oral reading comprehension scores and the percentage of time spent pausing within syntactic constituents while reading orally (Grade 2 $r = 0.151$; Grade 3 $r = -0.136$; Total $r = -0.012$).

Figure 5.21 reveals that when lack of word recognition abilities are included in the data, the



Significant Sources of Variance:

None

None

Grade (p=.0007)

FIGURE 5.21

PERCENTAGE OF READING TIME SPENT IN PAUSING WITHIN SYNTACTIC CONSTITUENTS

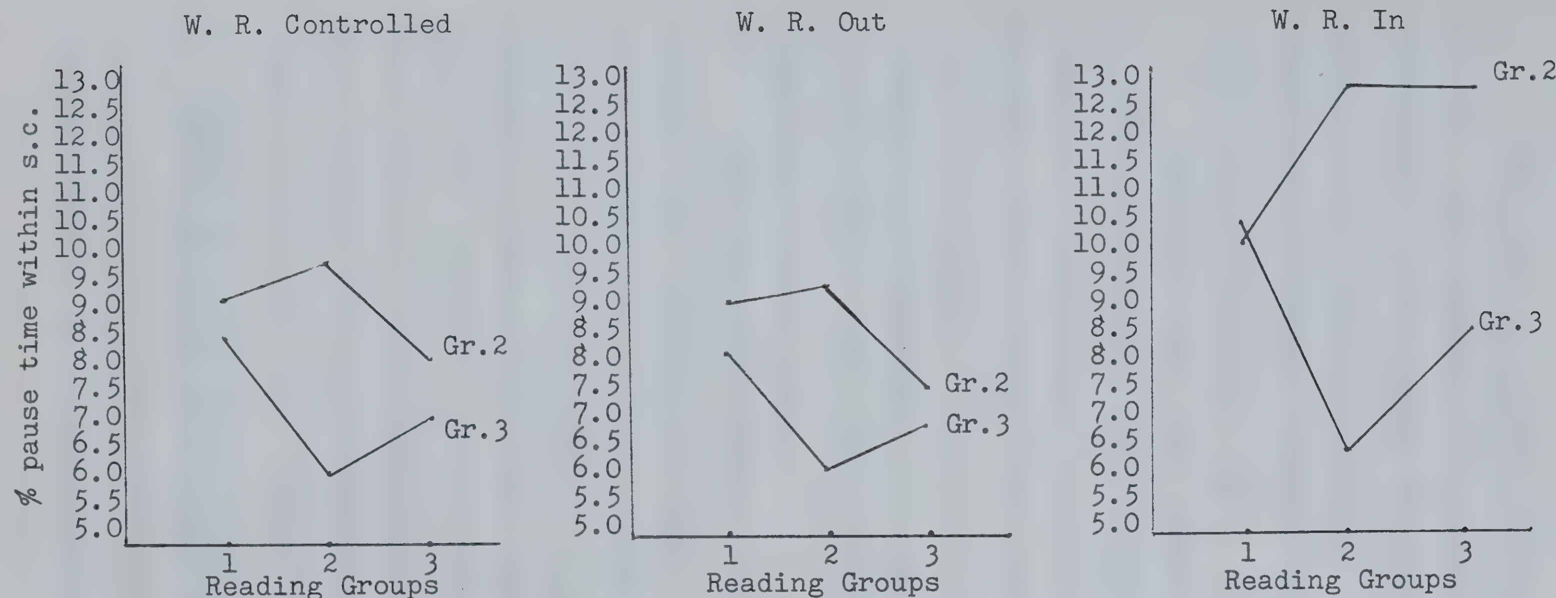
The data from which these graphs were constructed are found in Appendices J and K.

Analysis of Variance is able to discriminate between grade levels ($p = .0007$), but not between oral reading groups nor sexes. There are no significant sources of variance when the criteria W. R. Controlled or W. R. Out are considered, nor are there any interaction effects using any of the three criteria.

Grade two children, while reading orally, material of increasing difficulty, pause longer within syntactic constituents, but this seems to occur only when word recognition abilities are considered. The pausing of these children, then, is a factor of word recognition abilities, and not reading comprehension. The amount of time children spend pausing within syntactic constituents does not seem to be related to whether these groups of children read orally with good comprehension or not.

<u>On the first 70 Syntactic Constituents</u>: When only the first three paragraphs of the oral reading material are analyzed, there is still no significant relationship between oral reading comprehension scores and the percentage of time spent pausing within syntactic constituents (Grade 2 $r = -0.049$; Grade 3 $r = 0.210$; Total $r = 0.024$).

The Analysis of Variance over this same oral reading text, using the variable - percentage of reading time spent in pausing within syntactic constituents - showed no significant sources of variance at all when word recognition abilities were controlled or eliminated from the data (Figure 5.22).



Significant Sources of Variance:

None None Group (p = .04)

FIGURE 5.22

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

PERCENTAGE OF READING TIME SPENT IN PAUSING WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices J and K.

When word recognition abilities were included in the data, the Analysis of Variance indicated a significant difference ($p=.04$) between the oral reading groups. However, although this difference exists, the Scheffé test of significant differences between means was not able to reveal it at the acceptable level of significance ($p \leq .05$).

It seems then, quite logical to assume that when children read orally less difficult material, their comprehension of this material is not related to the amount of time they spend pausing within syntactic constituents, nor can the percentage of time spent pausing within syntactic constituents differentiate between oral reading groups, grades or sexes, using the Scheffé test of significant differences between means.

As Figure 5.22 indicates, the Grade two children of whatever oral reading comprehension group, tend to spend a greater percentage of time pausing within syntactic constituents. This same pattern emerged when children were grouped on the basis of silent reading comprehension, as in Chapter IV. However, the percentage of time spent pausing within syntactic constituents was much more discriminatory when children were grouped on the basis of silent reading comprehension scores (see Figure 4.22, Chapter IV, page 116).

C. <u>Number of Pauses Within Syntactic Constituents</u>

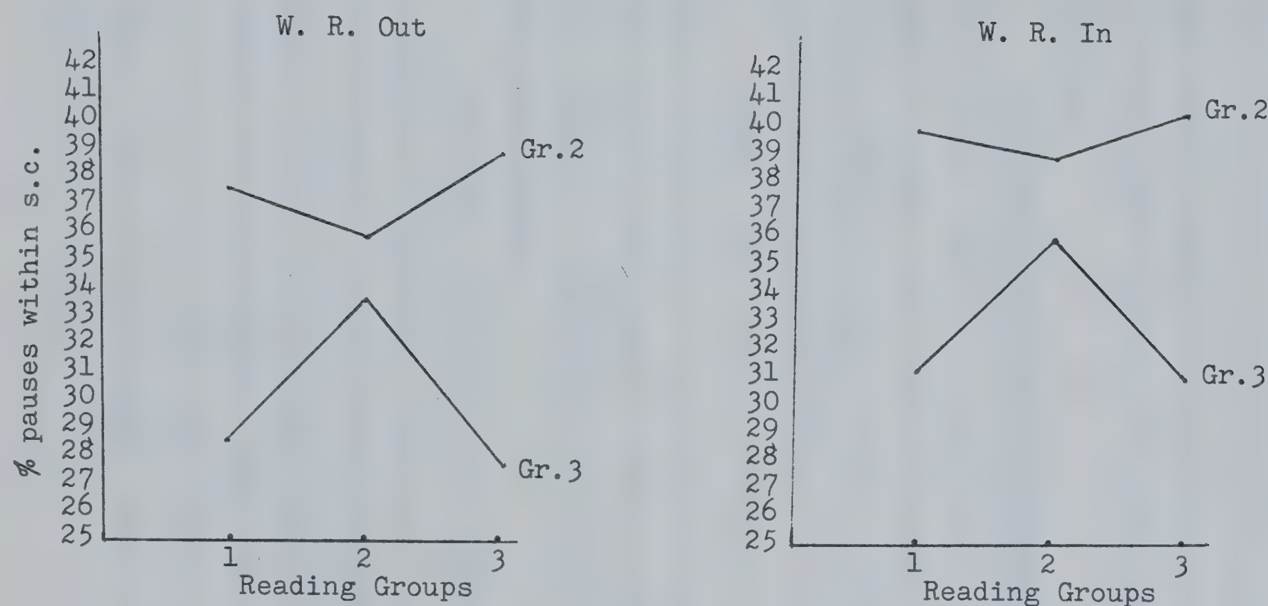
As already mentioned in Chapter IV, the measurement of the number of pauses made within syntactic constituents

did not vary for the two criteria W. R. Controlled and W. R. In. That is, when these measurements were made, the same number of pauses were counted. (It was the length of the pause which varied). Therefore, only the W. R. In and the W. R. Out criteria need to be considered in the discussion of this variable.

When the entire oral reading material is considered, the variable is discussed in terms of the ratio of number of pauses made within syntactic constituents to the number of opportunities to pause within syntactic constituents. However, for the analysis of the first 70 syntactic constituents, no ratios were needed, as the number of opportunities to pause within syntactic constituents remained constant for each subject.

<u>On entire Oral Reading Material</u>: There were no significant relationships between oral reading comprehension scores and the ratio of number of pauses made within syntactic constituents to number of opportunities to pause within syntactic constituents (Grade 2 $r = -0.168$; Grade 3 $r = -0.035$; Total $r = -0.122$).

Figure 5.31 reveals that the Analysis of Variance could only indicate one significant source of variance, and such was only evident when lack of word recognition abilities were eliminated from the data. Even when skill in word recognition was ignored, the Grade two children used significantly more pauses ($p=.02$) within syntactic constituents, than did the Grade three children (Grade 2



Significant Sources of Variance:

Grade (p=.02)

None

FIGURE 5.31

RATIO: NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS TO NUMBER OF OPPORTUNITIES TO PAUSE WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices J and K.

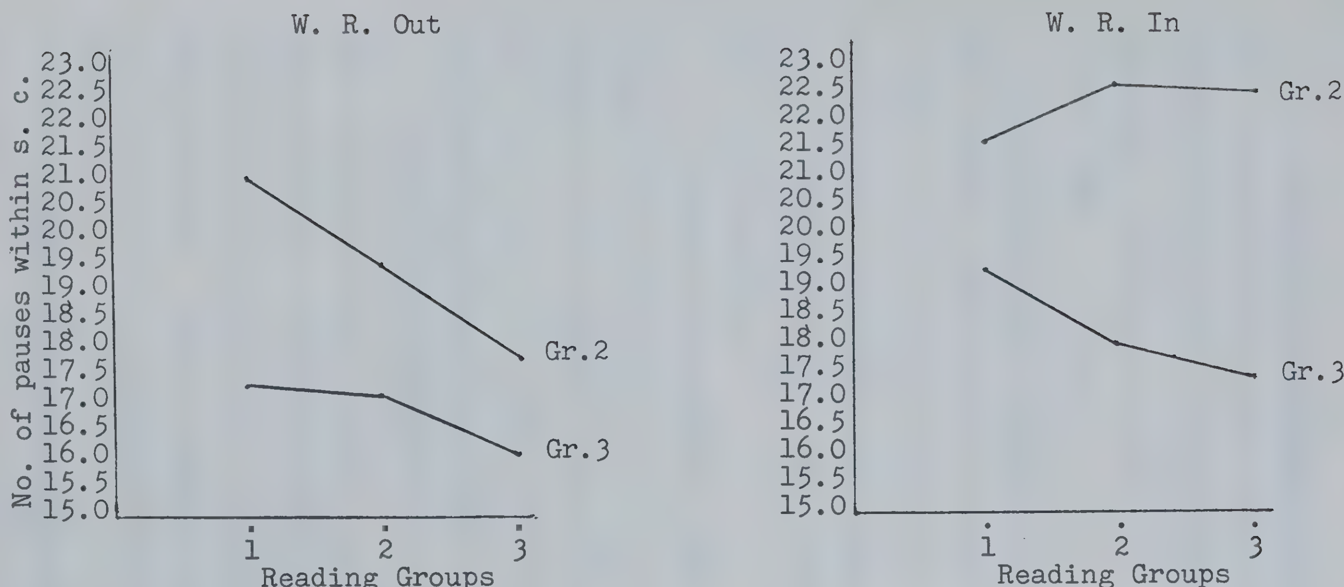
$\overline{M} = 37.3$; Grade 3 $\overline{M} = 29.7$).

When word recognition abilities were included in the analysis, this variable could not significantly discriminate between grades when children were grouped according to oral reading comprehension scores, but the Grade two children still tended to use more pauses within syntactic constituents.

On first 70 Syntactic Constituents: Correlation coefficients indicate no significant relationship between number of pauses made within syntactic constituents while reading orally, and oral reading comprehension (Grade 2 $r = 0.048$; Grade 3 $r = 0.081$; Total $r - 0.044$).

Figure 5.32 reveals that in the three-way Analysis of Variance there were no significant main effects due to oral reading group, grade or sex on this variable, whether word recognition abilities were ignored or included in the pause measurements.

Therefore, as far as oral reading comprehension is concerned, it seems that there is no significant relationship between it, and the number of pauses children make within syntactic constituents while reading orally. It can, however, be noted (Figure 5.32) that Grade two children consistently pause more often within syntactic constituents than do Grade three children, even on the less difficult material.



Significant Sources of Variance:

None

None

FIGURE 5.32

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS

The data from which these graphs were constructed are found in Appendices J and K.

D. Average Length of Pause Within Syntactic Constituent

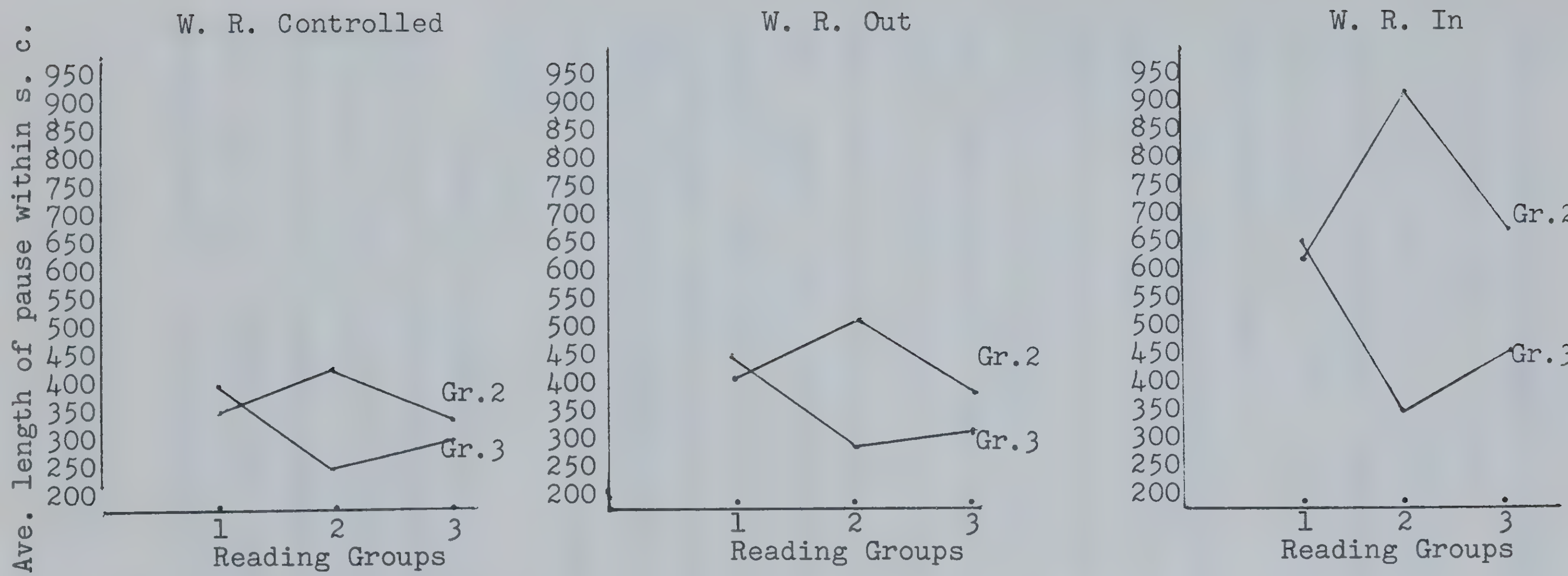
On entire Oral Reading Material: Once again, there were no significant correlations between oral reading comprehension scores and the average length of pause within syntactic constituent (Grade 2 $r = -0.002$; Grade 3 $r = 0.273$; Total $r = 0.110$).

However, when children were grouped according to oral reading comprehension scores, the variable - average length of pause within syntactic constituent - was able to discriminate between grades, using all three criteria (W. R. Controlled, W. R. Out, and W. R. In). See Figure 5.41 and Appendix J.

Although the analysis also indicated the presence of a significant difference between oral reading comprehension groups on this variable, using the two criteria (W. R. Controlled and W. R. Out), the Scheffé test of significance was unable to detect this difference.

Using the criterion W. R. In, neither analysis - grouping according to silent reading (as in Chapter IV), nor grouping according to oral reading comprehension - showed statistically significant differences between groups on this variable. Word recognition abilities then, must be an important factor when this variable is considered.

On first 70 Syntactic Constituents: Correlations expressing the relation between oral reading comprehension scores and average length of pause within syntactic con-



Significant Sources of Variance:

W. R. Controlled		W. R. Out		W. R. In	
Group	(p=.01)	Group	(p=.02)	Grade	(p=.0009)
Grade	(p=.02)	Grade	(p=.01)		
Group-Grade	(p=.009)	Group-Grade	(p=.01)		
		Grade-Sex	(p=.03)		

FIGURE 5.41

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT MEASURED IN MILLISECONDS

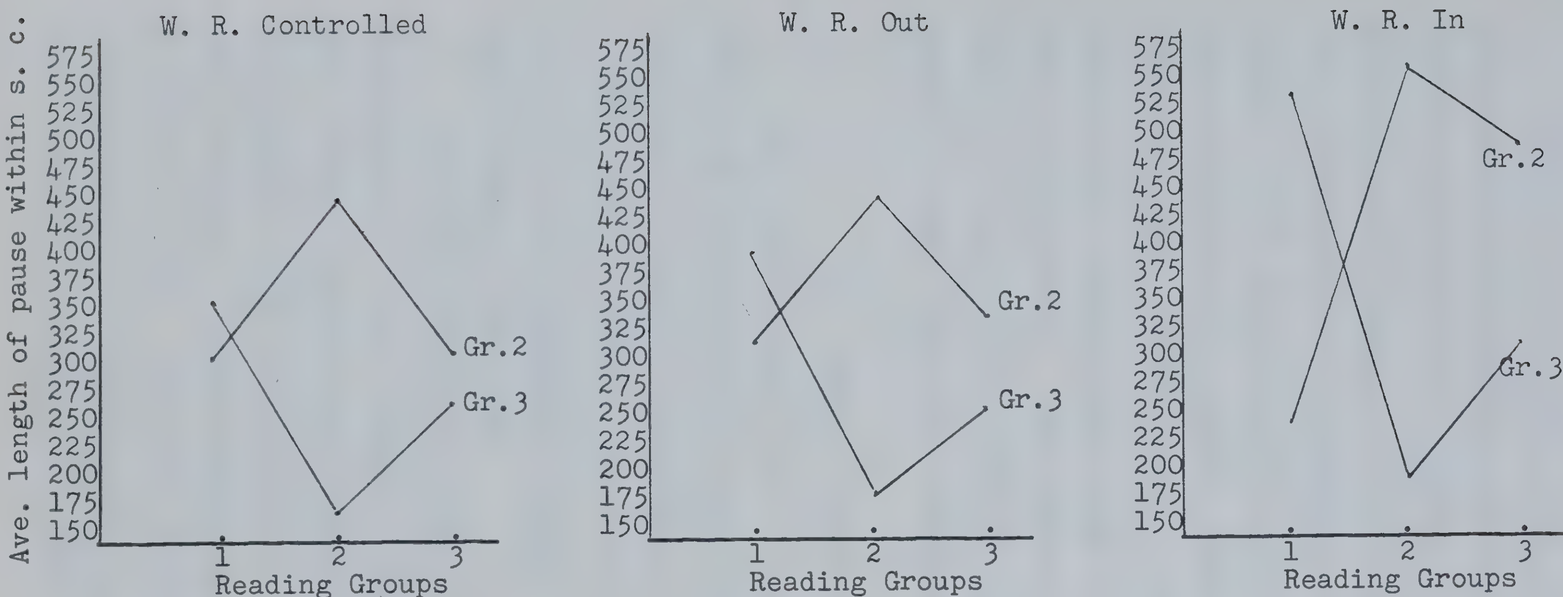
The data from which these graphs were constructed are found in Appendices J and K.

stituent were not significant (Grade 2 $r = -0.117$; Grade 3 $r = 0.028$; Total $r = 0.036$).

In Figure 5.42, it is evident there are no significant sources of variance when lack of word recognition abilities are included in the data, and the less difficult oral reading material is analyzed.

The sources of variance for the less difficult material are similar to those for the entire oral reading material, except that on the first three paragraphs there is no Grade-Sex interaction when the effects of lack of word recognition are eliminated from the data. The Group-Grade interaction effects were also exactly the same as those found when all the data on this variable were analyzed (see Appendix K). The average length of pause within syntactic constituent for the Grade two Second group was significantly longer than the average length of pause within syntactic constituent for the Grade three Second group. There were no other significant Group-Grade interaction effects.

Using the criteria W. R. Controlled and W. R. Out, on the first 70 syntactic constituents, the average length of pause within syntactic constituent is able to significantly discriminate between groups and grades. However, as in the entire oral reading data, the group main effect was not strong enough to be determined by the Scheffé test.



Significant Sources of Variance:

W. R. Controlled		W. R. Out		W. R. In
Group	(p=.007)	Group	(p=.01)	None
Grade	(p=.02)	Grade	(p=.03)	
Group-Grade	(p=.005)	Group-Grade	(p=.004)	

FIGURE 5.42

ANALYSIS OF FIRST 70 SYNTACTIC CONSTITUENTS

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT MEASURED IN MILLISECONDS

The data from which these graphs were constructed are found in Appendices J and K.

Since the inclusion of lack of word recognition abilities into the analyses did not produce any significant differences between oral reading groups, it seems that the syntactic and/or semantic difficulty of the material being read may account for the differences in the ranges of the average length of pause measurements. Over all the oral reading material, the average length of pause time ranged from 242.5 msec. to 916.7 msec. When the less difficult material was analyzed, the range of means was from 169.2 msec. to 556.9 msec. This appears to indicate that as the children read the more difficult material, their average length of pause increased considerably.

IV. SUMMARY AND CONCLUSIONS

The conclusions of this chapter necessitate a recapitulation of the distinction between the reading processes (one aspect of which is manifested in this study by how children use the pausing phenomena in oral reading), and a product of these processes, namely, the comprehension or understanding of the text.

Although Chapter IV seems to indicate that the pausing phenomena in oral reading is able to discriminate between various silent reading ability groups, the data in this chapter appear to indicate no relationship between the oral and silent reading comprehension scores of the children in the test sample. Further, although the pausing variables investigated in this study were able to differentiate, under various circumstances, between Above-average, Average

and Below-average silent reading comprehension scores, they were not able to differentiate between First, Second and Third groups when the children were divided on the basis of oral reading comprehension scores.

Some of this discrepancy between oral and silent reading scores could be due to the fact that the oral reading comprehension groups, by the very nature of the design of the study, did not contain the amount of variance that the silent reading comprehension scores had. However, Table 5.2 (page 140), indicates that the distribution of the oral reading comprehension scores followed the normal curve pattern, and Table 5.1 (page 138), reveals that the means of the oral reading groups were sufficiently distinct.

It, therefore, seems reasonable to conclude from the results of these data, that oral reading perhaps should be used primarily as a diagnostic tool to try to detect the reading "processes" that the child is using. Oral reading comprehension, however, does not seem to be an adequate gauge of how well a child may comprehend what he reads silently. Oral reading, it appears, is not a very effective tool to use in trying to differentiate between children with various degrees of silent reading comprehension ability. A child who comprehends very poorly what he has read orally, may comprehend excellently what he can read silently. It could be that in oral reading, too many other factors involved, distract him from

the semantic context. On the other hand, Below-average silent readers and the younger children, do seem to comprehend oral reading material better than do those children who have the least difficulties in silent reading comprehension. It seems that for these Below-average, and younger silent readers, the oral reading of the material reinforces in their minds what they are reading, and also provides the feed-back necessary for them to comprehend better. However, for the more proficient silent reader, oral reading seems to be more of a hindrance than a help to comprehension. It may also be that oral reading, by the very nature of the task involved, i.e. the necessity of audible articulation, slows down the speed with which the text may be processed, and thus interfers with the comprehension of the more able silent readers.

Whether silent or oral reading comprehension groups were considered, the Grade three children in this sample always tended to perform more efficiently than the Grade two children, in the sense that they used fewer pauses within syntactic constituents and shorter length of pause time within syntactic constituents. It seems that children learn how to use the pause as a linguistic tool to help them comprehend what they are reading, whether this is orally or silently.

The data also indicated that word recognition ability skills do play a role in differentiating both silent and oral reading comprehension groups. The

inclusion of pause measurements due to lack of word recognition ability in the silent reading data caused increases in the significant sources of variance 33 per cent more often than did the W. R. controlled and/or W. R. Out criteria. However, this increase in the significant sources of variance, expanded to 57 per cent when the oral reading data were analyzed using the W. R. In criterion (and including only those significant differences which the Scheffé test could identify). Therefore, it appears that when silent and oral reading comprehension ability groups are compared, word recognition skills play a much more important function in oral reading than they do in silent reading.

At the Grade three level, it seems that a longer pause time, even if it occurs within a syntactic constituent, resulted in a higher comprehension score when the children were reading orally. This phenomenon did not occur in silent reading at all, nor did it occur at the Grade two level in oral reading. The only explanation that seems acceptable at this time is that the children who obtained higher scores on the oral reading comprehension material at the Grade three level are perhaps already learning a new reading "process" - that of reading ahead of themselves silently - hence they are pausing longer in their oral reading of the material, but comprehending better.

In concluding this Chapter, it seems reasonable

to suggest that there is no relationship between oral and silent reading comprehension scores obtained by the children in this test sample, as measured by the tests used in this investigation, and further - that there is very little relationship between the four pausing variables used in this study and the oral reading comprehension scores made by these children.

CHAPTER VI

FINDINGS: THE RELATIONSHIP OF INTELLIGENCE AND MEMORY SPAN TO PAUSING AND READING COMPREHENSION

This final Chapter of findings deals with Hypotheses nine, ten and eleven.

In Chapter II many research studies dealing with the auditory and visual reception and processing of oral and written language were enumerated. These studies indicate that short term memory seems to play an important role in this area, of which reading constitutes a part. Therefore, it was felt that an interesting aspect of this study would be to attempt to measure the auditory and visual memory spans of the children in this test sample, and to relate these findings to the four pause variables being investigated.

In addition, since intelligence tests were administered to the sample (primarily to ascertain that Below-average silent readers were not below-average in intelligence), these test scores were also analyzed in relation to the children's use of the pause in oral reading.

Finally, memory span and intelligence were subjected to two, three-way Analyses of Variance (grouping according to silent reading comprehension scores, grade and sex; and also grouping by oral reading comprehension

scores, grade and sex). These analyses were conducted to determine whether these independent variables (memory span and intelligence) could discriminate between the various silent and oral reading comprehension groups, between the grade levels, or between the sexes.

Whenever correlation coefficients for pausing variables are reported, these were determined by using the control for word recognition abilities built into the design of the study, and explained in Chapter III. Correlation coefficients are tabulated in Appendix I.

Appendices G and J contain the three-way Analysis of Variance data on the variables - auditory memory span for digits forward, auditory memory span for digits backward, visual memory span, and intelligence.

I. AUDITORY MEMORY SPAN FOR DIGITS FORWARD

The auditory memory span means for digits forward, of each group of silent and oral readers, are listed in Table 6.1.

These digit span means are very similar for all ability groups. Table 6.1 also reveals that the Below-average or Third group children in both silent and oral reading groups, have slightly longer spans than the Above-average or First group children. This is especially noticeable in the case of the less able Grade three boys. The Third group of Grade two girls, when grouped according

TABLE 6.1

AUDITORY MEMORY SPAN FOR DIGITS FORWARD

Gr.		Silent Reading Groups				Oral Reading Groups		
		Boys	Girls	Total		Boys	Girls	Total
2	Ab.-Av.	5.3	5.8	5.6	First	4.8	5.5	5.3
	Ave.	4.5	5.2	4.8	Second	5.6	5.3	5.4
	Be.-Av.	5.5	5.8	5.7	Third	5.0	6.7	5.4
	Gr. $\overline{M}$ =	5.1	5.6	5.4	Gr. $\overline{M}$ =	5.1	5.6	5.4
3	Av.-Av.	5.8	5.3	5.6	First	6.0	5.2	5.6
	Ave.	6.2	5.5	5.8	Second	5.8	5.7	5.8
	Be.-Av.	6.0	5.3	5.7	Third	6.2	5.3	5.8
	Gr. $\overline{M}$ =	6.0	5.4	5.7	Gr. $\overline{M}$ =	6.0	5.4	5.7

to oral reading comprehension scores, also have a much longer auditory memory span for digits than do the other Grade two groups, and even longer than those of the Grade three children. The possession of a longer auditory memory span, as measured by these tests, does not seem to indicate better reading comprehension.

The correlation coefficients between the digit span forward of the children in the test sample, and the four pausing variables used in this study: (percentage of total reading time spent in pausing, ratio of pause time within syntactic constituents to total reading time,

number of pauses within syntactic constituents, and average length of pause within syntactic constituent), were not statistically significant at any grade level, nor for the total group. The coefficients were extremely low - none was greater than 0.177 (see Appendix I). Furthermore, there were no statistically significant relationships between silent reading comprehension and auditory memory span for digits forward, nor between oral reading comprehension and auditory memory span for digits forward.

The three-way Analysis of Variance revealed no significant main effects due to group, grade or sex when silent reading groups were considered (Appendix G), nor when oral reading groups were analyzed (Appendix J). However, in both cases there was a significant Grade-Sex interaction (Appendices G and J). The digit span forward of the Grade three boys was significantly longer ($p < .05$) than that of the Grade two boys (Grade 3 $\overline{M} = 6.0$; Grade 2 $\overline{M} = 5.1$). None of the other Grade-Sex interactions were significantly different from this highest span of 6.0.

II. AUDITORY MEMORY SPAN FOR DIGITS BACKWARD

Table 6.2 lists the auditory memory span means for digits backward, of the test sample.

Again, all the digit span backwards are very similar. The Grade three Below-average girls (grouped on silent reading comprehension) had slightly shorter spans than the rest of the test sample groups, but the means of the boys

TABLE 6.2

AUDITORY MEMORY SPAN FOR DIGITS BACKWARD

Gr.	Silent Reading Groups	Boys	Girls	Total	Oral Reading Groups	Boys	Girls	Total
2	Ab.-Av.	3.5	3.0	3.3	First	3.8	3.0	3.3
	Ave.	3.0	3.2	3.1	Second	3.2	3.3	3.3
	Be.-Av.	3.2	3.5	3.2	Third	3.0	3.7	3.2
	Gr. $\overline{M}$ =	3.2	3.2	3.2	Gr. $\overline{M}$ =	3.2	3.2	3.2
3	Ab.-Av.	3.8	3.8	3.8	First	3.3	3.5	3.4
	Ave.	3.5	3.5	3.5	Second	3.7	3.7	3.7
	Be.-Av.	3.3	2.8	3.1	Third	3.7	3.0	3.3
	Gr. $\overline{M}$ =	3.5	3.4	3.5	Gr. $\overline{M}$ =	3.6	3.4	3.5

and the girls, at each grade level, were almost identical.

Correlation coefficients between all four pausing variables and auditory memory span for digits backward were very low, and none were statistically significant (see Appendix I).

As would be expected by the means shown in Table 6.2, the Analyses of Variance revealed no significant sources of variance on any of the main factors of silent reading group, oral reading group, grade, or sex.

The data from this study seems to indicate that not only is auditory memory span for digits backward not related to any of the pausing variables investigated, but it is

also not a significant factor in either silent or oral reading comprehension. There is very slight evidence that it may possibly be a developmental skill, since the Grade three children consistently tended to have slightly longer spans than did the Grade two children. But these differences were very slight, and certainly not statistically significant.

There was a low, but statistically significant correlation ($r = 0.349$; $p = .03$) between silent reading comprehension and auditory memory span for digits backward at the Grade three level only. This relationship did not exist for the Grade two children, nor for the total group, nor did it occur between oral reading comprehension scores and auditory memory span for digits backward at any grade level. Therefore, although the evidence is very meagre, it seems possible to suggest that at the Grade three level, the children might be using some additional skill in silent reading comprehension which has some relationship to some skill needed to remember a span of digits backwards. Perhaps it is not a skill as such, but merely a developmental factor of memory that occurs at this level, and which tends to influence comprehension in silent reading.

III. VISUAL MEMORY SPAN FOR LETTERS

None of the four pausing variables used in this study showed any significant relationship to visual letter span,

at either grade level or for the total group, when the entire oral reading test was analyzed. However, when only the less difficult oral reading material was observed (the first 70 syntactic constituents), all four pausing variables correlated negatively and significantly with visual memory span for letters, but only at the Grade three level (Grade 3 r's: -0.478, -0.512, -0.367, -0.478. See Appendix I, Table I.3). For the Grade two children there was no significant relationship between any of the pausing variables and visual memory span for letters.

In the case of Grade three children, a longer visual memory span signified a smaller percentage of total time spent in pausing, fewer number of pauses made within syntactic constituents, shorter periods of pausing within syntactic constituents, and consequently, smaller average lengths of pauses within syntactic constituents. But these relationships only existed when reading material was at or below the Grade three level.

The slightly longer visual memory spans of the Grade three children, and the less difficult material seemed to be the cause of these significant relationships.

Table 6.3 shows the mean spans for the children in the test sample, first grouped according to silent reading comprehension ability, and then according to oral reading comprehension ability.

When children were grouped according to silent read-

TABLE 6.3

VISUAL MEMORY SPAN FOR LETTERS

Gr.	Silent Reading Groups	Boys	Girls	Total	Oral Reading Groups	Boys	Girls	Total
2	Ab.-Av.	5.0	5.0	5.0	First	5.0	4.6	4.8
	Ave.	4.5	4.8	4.7	Second	4.6	4.9	4.8
	Be.-Av.	4.3	4.5	4.4	Third	4.4	5.0	4.6
	Gr. $\overline{M}$ =	4.5	4.8	4.7	Gr. $\overline{M}$ =	4.6	4.8	4.7
3	Ab.-Av.	5.0	5.3	5.2	First	4.5	4.3	4.4
	Ave.	4.7	5.0	4.8	Second	4.8	5.5	5.2
	Be.-Av.	4.5	4.5	4.5	Third	4.8	5.0	4.9
	Gr. $\overline{M}$ =	4.7	4.9	4.8	Gr. $\overline{M}$ =	4.7	4.9	4.8

ing comprehension ability, although the mean scores at each grade level were very similar, there was a consistent trend, which was not apparent on the auditory memory span tests. Visual memory span for letters decreased systematically. Above-average silent readers at each grade level had longer spans than Average readers, while Average readers had longer visual memory span for letters than Below-average readers. This trend occurred for both boys and girls. As with the auditory memory span tests, Grade three children had slightly longer visual memory spans than Grade two children.

The Analysis of Variance on this variable - visual memory span for letters - revealed no significant sources of variance due to silent reading group , grade, or sex, nor were there any significant interaction effects.

There were, however, low but statistically significant correlation coefficients between silent reading comprehension scores and visual memory span for letters, at each grade level and for the total group (Grade 2 $r = 0.334$; Grade 3 $r = 0.389$; Total $r = 0.356$. See Appendix I). There is, then a slight relationship between visual memory span for letters and silent reading comprehension scores, but it is not strong enough to differentiate between Above-average and Below-average silent reading comprehension scores when an Analysis of Variance is applied to the visual memory span for letters data.

When children were grouped according to oral reading ability, the Grade three children still tended to have slightly longer visual memory spans, but the pattern within the groups was not consistent.

The Analysis of Variance on this variable - visual memory span for letters - when children were grouped according to oral reading comprehension scores, revealed a significant source of variance due to oral reading group ($p=.02$). The Scheffé test of significant differences between means indicated a significant difference ($p < .05$), between First and Second groups. A perusal of Table 6.3

reveals that this difference is due to the differences between the means of the First and Second groups at the Grade three level only (First group $\overline{M} = 4.4$; Second group $\overline{M} = 5.2$) because the First and Second groups in Grade two obtained the same mean length of visual memory span.

There were no statistically significant correlations, at any grade level, nor for the total group, between oral reading comprehension scores and visual memory span for letters.

IV. INTELLIGENCE TEST SCORES

Intelligence quotients are related to two of the four pausing variables, at the Grade three level: there is a significant negative correlation between intelligence and time spent pausing within syntactic constituents ($r = -0.351$). There is also a significant negative correlation between intelligence and number of pauses made within syntactic constituents ($r = -0.381$). The higher the intelligence quotient, the less time seems to be spent in pausing within syntactic constituents, or in the number of pauses made within syntactic constituents. This relationship occurred only when the entire oral reading test was analyzed. No relationship existed between intelligence and pausing variables at the Grade three level, when only the first 70 syntactic constituents were considered. However, at the Grade two level, correlation coefficients

did not reach significance until only the less difficult material was analyzed, and then only two pausing variables correlated negatively and significantly with intelligence: percentage of total reading time spent in pausing within syntactic constituent ($r = -0.343$), and average length of pause within syntactic constituent ($r = -0.409$).

Table 3.3 (Chapter III, page 66) reveals that for the total group, the Grade two children had slightly higher intelligence quotients than did the Grade three children, but the difference between the two means was not even one whole point (Grade 2 $\overline{M} = 107.6$; Grade 3 $\overline{M} = 106.5$). The significant relationship only at the Grade three level on the entire oral reading test, then, must be due to the differences in the data obtained on the two pausing variables: percentage of time spent pausing within syntactic constituents, and number of pauses made within syntactic constituents. These measurements on the Grade three children, reading orally, must be sufficiently smaller to cause the negative correlation only at that grade level.

At the Grade two level, significant relationships do not begin to appear between pausing variables and intelligence until the less difficult oral reading material is analyzed. For the Grade two children, the first 70 syntactic constituents would be more difficult than for the Grade three children, and perhaps comparable to the entire test for the Grade three's. Since intelligence

quotients are very similar at both grade levels, the pattern of negative relationship that seems to be emerging, probably is due to the pausing variables, and depends on grade level (or developmental stage of the child), and also on the difficulty of the material he is reading aloud.

Intelligence and silent reading comprehension scores are related significantly at both grade levels, and for the total group (see Appendix I). However, intelligence and oral reading comprehension scores are significantly correlated only at the Grade three level, and for the total group. Grade two oral reading comprehension scores do not appear to be related to the intelligence of the Grade two children.

Intelligence quotients for children in the test sample, grouped on oral reading comprehension scores, are indicated in Table 6.4. The intelligence quotients for the sample, grouped according to silent reading comprehension scores are listed in Chapter III, Table 3.3, page 66.

Table 6.4 indicates a more consistent pattern of intelligence quotient means and comprehension groups than did Table 3.3. First group children, when grouped by oral reading comprehension means, tended to obtain the highest intelligence quotient means, Second group children, the next highest mean, and Third group obtained the lowest intelligence quotient means. Only one score - that of Third group, Grade two boys - deviated from this pattern when oral reading groups were considered. When children

TABLE 6.4

INTELLIGENCE QUOTIENTS BY ORAL READING GROUP

Gr.	Oral Reading Group	Intelligence Quotients Boys	Girls	Total
2	First Group	113.5	107.1	109.3
	Second Group	107.4	106.7	107.0
	Third Group	107.8	102.7	106.5
			Grade 2 $\overline{M}$ =	107.6
3	First Group	111.8	113.0	112.4
	Second Group	103.7	107.3	105.5
	Third Group	103.2	100.2	101.7
			Grade 3 $\overline{M}$ =	106.5

were grouped according to silent reading comprehension scores, there were five deviations from this pattern (or no consistent pattern tended to emerge), although the Above-average readers always obtained highest intelligence quotient means.

A three-way Analysis of Variance on the variable, intelligence quotient, grouping according to silent reading comprehension scores, revealed a significant source of variance due to silent reading group (p=.0009). The Scheffé test of significant differences between means indicated two significant differences: 1) between Above-average and Average silent reading groups, and 2) between Above-average and Below-average groups. The Above-average silent reading group had significantly higher intelligence quotients than did the Average and Below-

average readers (Above-average $\overline{M}$ = 115.3; Average $\overline{M}$ = 102.9; Below-average $\overline{M}$ = 102.8).

An Analysis of Variance on the intelligence quotient, grouping according to oral reading comprehension scores indicated no significant main effect of any kind. There were no significant differences between the means of the groups, the grades, or the sexes, nor were there any interaction effects.

In summary, then, it can be stated that there is a significant relationship between silent reading comprehension and intelligence. Also that intelligence can differentiate Above-average silent readers from Average and Below-average silent reading groups.

At the Grade three level, oral reading comprehension scores and intelligence are significantly related, but this relationship does not exist at the Grade two level, even though the mean intelligence quotients for Grade two and Grade three were very similar (see Table 6.4), and the oral reading comprehension scores of the two grades differed by only 2.6 points (Table 5.1, page 138). The range of scores, however, for Grade three oral reading comprehension was consistently higher than that for the Grade two children (Table 5.1), and more Grade three children scored higher on the oral reading comprehension (Table 5.2, page 140). These differences would probably account for the significant relationship between oral reading comprehension scores and intelligence at the Grade three level, but not at the Grade

two level, because the ranges of intelligence scores were very similar at both grade levels (Grade 2 range: 87-123; Grade 3 range: 85-123). See Table 3.3, Chapter III, page 66.

The negative and statistically significant relationship between intelligence and two of the pausing variables at the Grade three level, and not at the Grade two level on the total test, can be accounted for, by the fact that the Grade three children consistently used fewer pauses and shorter lengths of pause within syntactic constituents, than did the Grade two children. On the less difficult material, however, the Grade two children were able to reduce their pausing enough to cause a negative and significant correlation between intelligence and two of the pausing variables.

V. SUMMARY AND CONCLUSIONS

In summarizing the relationship of memory span and intelligence to the pausing variables and reading comprehension (whether silent or oral), it is interesting to note that there were three significant relationships that occurred only at the Grade three level: 1) between visual memory span for letters and all the four pausing variables, on the less difficult material only, 2) between auditory memory span for digits backward and silent reading comprehension scores, and 3) between intelligence and oral reading comprehension scores.

There may be a relationship, for these older children, between the process of how they can use memory and rhythm (one use of the pause) to remember letters presented to them visually - and their use of the pause in reading, if the material is easy enough.

At the higher grade level, there also appears to be some ability necessary in recalling digits in reverse order that is related to silent reading comprehension - probably something to do, not only with memory as such, but with the organization of the material in the mind. It seems that this more complicated ability may begin to appear at the Grade three level.

The relationship between intelligence and oral reading comprehension scores which exists only at the Grade three level may be due to the higher oral reading scores obtained by the older children (ranging between 23 and 90), as opposed to the range of the Grade two children (between 17 and 83), since the means of the intelligence quotients for both grades were very similar (Grade 2 $\overline{M}$ = 107.6; Grade 3 $\overline{M}$ = 106.5).

There is then, in this Chapter, some evidence to suggest a definite, but almost imperceptible, developmental trend trend in the data, especially as it relates to auditory and visual memory spans, and to pausing and comprehension in reading. If more grade levels had been used in the sample, perhaps the trend would have become more apparent.

CHAPTER VII

SUMMARY AND CONCLUSIONS

A brief summary of the study and an outline of the main findings will be presented in this Chapter. In addition, conclusions will be drawn from the findings and the implications of these conclusions for reading theory and the teaching of reading will be discussed. Recommendations for further research will also be made.

I. SUMMARY OF THE STUDY

The purpose of this study was to investigate the relationship between pauses made by children while reading orally, and their oral and silent reading comprehension abilities. In addition to investigating the "products" - the actual pausing phenomena employed while reading orally, and the two types of comprehension abilities - an effort was also made to acquire further insights into the reading "processes" of young children.

A further attempt was made to investigate the pausing phenomena (which were considered to be the behaviorial manifestation of how children are organizing the visual input of written language), and to relate these phenomena to memory span (both auditory and visual), and also to intelligence.

The test sample consisted of 72 children - twelve

Above-average, twelve Average, and twelve Below-average readers at each of Grades two and three levels. A stratified random sampling procedure was used to select the sample from four schools in the Edmonton Catholic School System. These schools served children whose parents were of upper middle class socio-economic status.

Each child was administered the oral reading test, the word recognition test, the auditory and visual memory span tests, and the intelligence test, by the investigator. The graphic displays of the oral reading audio tapes were also made by the investigator, assisted by an engineer from the Electronics Division of the Technical Services Department, University of Alberta. A doctoral candidate at the University of Alberta assisted the investigator in the actual measurement of the pauses. The results of all the collected data were processed by computer at the Division of Educational Research Services, University of Alberta.

II. SUMMARY OF MAIN FINDINGS AND DISCUSSIONS

This section will present the null hypotheses outlined in Chapter I, and indicate the conclusions reached by the investigator in relation to the testing of the hypotheses. A discussion of results, based on each hypothesis, will also be included in this section.

Hypothesis 1.10

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the percentage of total reading time spent in pausing while reading orally the complete test,
>
> 1.11 when the effect of inadequate word recognition ability is controlled;
>
> 1.12 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 1.13 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 1.11: When the effect of inadequate word recognition is controlled, and the entire oral reading material is analyzed, the percentage of total reading time spent in pausing while reading orally significantly discriminates between Above-average readers and Below-average readers only. Above-average readers used significantly less pause time than did the Below-average readers.

Hypothesis 1.12: When the effects of word recognition ability were eliminated from the data, and the entire oral reading material analyzed, Above-average readers used significantly less pause time while reading orally than did Below-average readers, but there were no significant differences between Average readers and Above-average readers, nor between Average readers and Below-average readers.

Hypothesis 1.13: When the effects of inadequate word recognition ability were included in the data, there is a significant difference between all three groups in the percentage of reading time spent in pausing, over the entire oral reading material: Above-average readers differed significantly from Average and Below-average readers;

Average readers differed significantly from Above-average and Below-average readers; Below-average readers differed significantly from Average and Above-average readers. In all cases, the more capable silent reading group used significantly less pause time.

In analyzing these three sub-divisions of Hypothesis 1.10, it appears that the percentage of reading time spent pausing while reading orally, is able to discriminate between silent reading comprehension groups of varying degrees of ability. The more competent silent readers always use less pause time when they read orally than do the less competent silent reading groups. This finding - that the differences in pausing time while reading orally were able to differentiate significantly between silent reading ability groups - tends to lend some support to the contention of Pival (1971), Goodman (1968) and McCracken (1967), that the silent and oral reading processes of young children may be very similar. Although pausing is measured as an output in oral reading, it may also be indicative of one aspect of processing - that is, how the children are organizing or grouping the visual input.

The differences between the silent reading groups is much more pronounced between Above-average and Below-average readers. Even when pauses due to lack of word recognition skills were eliminated entirely from the data, there was still a significant difference between Above-average and Below-average readers, indicating that word

recognition is not the big factor in this discrepancy between these two groups of silent readers. This discrepancy could be a factor of the reading processes employed by these two groups of children. There does not seem to be the same discrepancy between Above-average and Average groups as there is between Average and Below-average readers.

Hypothesis 1.20

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the percentage of total reading time spent in pausing while reading orally the first 70 syntactic constituents of the test (which was the oral reading material read in common by all subjects),
>
> 1.21 when the effect of inadequate word recognition ability is controlled;
>
> 1.22 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 1.23 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 1.21: When the oral reading material read in common by all children was analyzed (the first 70 syntactic constituents, or first three paragraphs of the oral reading test), and word recognition ability was controlled, not only was there the significant difference between Above-average readers and Below-average readers (as there was when the complete test was analyzed), but there was also a significant difference between Average readers and Below-average readers. Average readers paused significantly less while reading orally than did Below-average readers.

Hypothesis 1.22: When the effects of word recognition ability were eliminated from the data, and only the

first 70 syntactic constituents were considered, there were no significant differences between any of the three silent reading ability groups.

Hypothesis 1.23: When data due to lack of word recognition ability were included in the analysis of the first 70 syntactic constituents read in common by all groups, there were significant differences between Above-average readers and Below-average readers; and between Average readers and Below-average readers.

The three types of data analysis carried out under Hypothesis 1.20 indicates that when the oral reading material is at or below grade level, and lack of word recognition skills are included in the data, there does not seem to be such a discrepancy between the Above-average and Average readers as there is under these same conditions when all the oral reading material is considered.

In addition, there are no significant differences at all between any of the silent reading groups when only the less difficult material is analyzed (first three paragraphs of the oral reading test), and all pausing due to lack of word recognition skills is eliminated from the data. Eliminating word recognition abilities from the entire oral reading material, however, still caused a significant difference between Above-average and Below-average silent reading groups. This significant difference between Above-average and Below-average readers on the increasingly difficult material may possibly be due to the semantic and syntactic complexity of the reading

text itself. When the reading material is less difficult in semantic and syntactic content, no significant differences appear between Above-average and Below-average silent reading groups while reading orally. This seems to indicate that on this less difficult material, the Below-average readers are able to use the reading processes more efficiently and similar to the effectiveness obtained by the Above-average readers on the more complex material. This would add some support to Chomsky and Halle's (1968) contention that the oral reading of a text requires quite sophisticated linguistic skills. The less competent silent readers do not seem to possess the sophistication to read orally in a similar manner to the Above-average silent readers, unless the material is relatively simple in semantic and syntactic content.

Chomsky and Halle's vague term "sophisticated linguistic skills", when applied to the children in this study, seems to mean that the children who are not yet able to cope efficiently with graphic input are those who are not yet sufficiently skilled to be able to operate simultaneously in decoding the semantic and syntactic domains.

When only the less difficult material was analyzed and lack of word recognition abilities eliminated from the data, the percentage of time spent pausing while reading orally, could not discriminate between any of the silent

reading groups, and all the children in the test sample used about the same percentage of pause time. This pause time (31.5%) was almost identical to that which Goldman-Eisler (1968) found that fluent adult oral readers used (30.0%).

Discussion of Hypothesis One

The percentage of reading time spent in pausing while reading orally is able to discriminate significantly between the silent reading ability groups of the test sample. If the way children are pausing in oral reading is an indication of how they may be processing the orthographic code, then the fact that the time spent in pausing while reading orally can significantly differentiate between silent reading groups of varying abilities, may indicate that the silent and oral reading processes of these young children are very similar. It is, however, necessary to keep in mind that "processes" (as indicated in this study by the oral reading pausing phenomena, and measured by the length, placement and number of pauses), is not synonomous with the "products" (which in this study are considered to be manifested by the silent and oral reading comprehension scores of the children).

The data from hypothesis one also discloses with some degree of certainty that the reading processes used by young children depend on three factors: 1) lack of word recognition skills, 2) the semantic and syntactic complexity of the text to be read, and 3) the inability to deal efficiently with the simultaneous decoding and synthesis of semantics

and syntax, - or the lack of linguistic sophistication.

Hypothesis 2.10

> That Average readers, Above-average readers and Below- average readers do not differ significantly in the period of time spent pausing within syntactic constituents while reading orally the complete test,
>
> 2.11 when the effect of inadequate word recognition ability is controlled;
>
> 2.12 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 2.13 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 2.11: When word recognition ability was controlled, and the entire oral reading material considered, the percentage of time spent pausing within syntactic constituents could not significantly differentiate between any of the three silent reading groups.

Hypothesis 2.12: When all effects due to lack of word recognition were eliminated from the entire data, the percentage of total reading time spent pausing within syntactic constituents, could not discriminate between any of the silent reading groups.

Hypothesis 2.13: When the data for all the oral reading material was left intact, and no considerations made for possible lack of word recognition skills, the percentage of time spent pausing within syntactic constituents could significantly differentiate between all the silent reading groups: between Above-average and Average readers; between Average and Below-average readers; and between Above-average and Below-average groups. In all cases, the more competent silent readers spent significantly less time

pausing within syntactic constituents while reading orally.

In analyzing the entire oral reading material with the three different criteria used in this study, it was observed that the percentage of time spent pausing within syntactic constituents does not significantly discriminate between silent reading ability groups unless lack of word recognition skills are considered in their entirety. Therefore, all pausing within syntactic constituents seems to be due to lack of word recognition ability, which may indicate that children reading orally (regardless of what silent reading comprehension ability group they compose), are not likely to pause within a syntactic constituent unless they do not know a word. All the children in this test sample tended to resist a disruption within a syntactic constituent if at all possible.

This finding agrees with the research on the processing of written language mentioned in Chapter II, especially that of Wilkes and Kennedy (1970), Martin, Kolodziez (1971) and Brown (1971), even though their research was done with adult readers.

However, when the percentage of pause time within syntactic constituent occurs because of word recognition ability, the amount of this time can very definitely and significantly discriminate between silent reading groups. The more competent the silent reading group, the less percentage of pause time occurs within syntactic constituents while reading orally.

Hypothesis 2.20

That Average readers, Above-average readers and Below-average readers do not differ significantly in the period of time spent pausing within syntactic constituents while reading orally the first 70 syntactic constituents of the test,

2.21 when the effect of inadequate word recognition ability is controlled;

2.22 when the effect of inadequate word recognition is eliminated from the data;

2.23 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 2.21: When the effect of inadequate word recognition ability is controlled, and the first 70 syntactic constituents of the data analyzed, the variable - percentage of time spent pausing within syntactic constituents, could significantly differentiate between Above-average and Below-average readers; and also between Average and Below-average readers.

Hypothesis 2.22: When all effects due to lack of word recognition were eliminated from the first 70 syntactic constituents, the percentage of time spent pausing within syntactic constituents discriminated significantly between Above-average and Below-average readers; and between Average and Below-average readers.

Hypothesis 2.23: When only the first 70 syntactic constituents were considered with data due to lack of word recognition abilities included, there were significant differences between the means of Above-average and Below-average readers; and between Average and Below-average.

An interesting observation in the investigation of

Hypotheses 2.21, 2.22, and 2.23 was that on the less difficult oral reading text, whether word recognition was controlled, measured in entirety, or eliminated, there was always a significant differentiation between Above-average and Below-average silent readers, and Average and Below-average, on the percentage of time spent pausing within syntactic constituents. The significant differences which occurred using the two criteria W. R. Controlled and W. R. Out, were only observed on the less difficult material, and always between the Below-average readers and the other two silent reading groups. It seems to be due to the Above-average and Average readers reading the easier material at a much faster rate than they read the entire test material. The Below-average readers read the less difficult material, and the entire test, with a much more consistent pattern of percentage of pause time within syntactic constituents. The result, then, seems to be that the more competent readers tend to read the easier oral reading material with more considerable speed and apparently a more efficient approach.

Discussion of Hypothesis Two

The percentage of time spent pausing within syntactic constituents appears to be due entirely to lack of word recognition skills, since this is the only criterion which, when included in the entire data, can discriminate between the silent reading ability groups. If such differences in performance were due entirely to lack of word recognition skills, then similar results should have been obtained when

the less difficult oral reading material was analyzed. The fact is that an analysis of this variable over the less difficult oral reading material seems to indicate that in reality, Below-average readers are using a much less efficient phase of the reading process than are the Above-average and Average readers, since these Below-average readers differed significantly from the other two groups when all three criteria are considered, and the less difficult oral reading material is investigated.

<u>Hypothesis 3.10</u>

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the number of pauses made within syntactic constituents while reading orally the complete test,
>
> 3.11 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 3.12 when the effect of inadequate word recognition ability is included in the data.

<u>Hypothesis 3.11</u>: The ratio of number of pauses made within syntactic constituents to the number of opportunities to pause within syntactic constituents,(when the effect of inadequate word recognition ability was eliminated from the data), could discriminate significantly between Above-average and Average readers; and between Above-average and Below-average readers. The more competent silent readers (even when the differences between means did not reach significance) always paused less often within syntactic constituents.

<u>Hypothesis 3.12</u>: When the effects due to lack of word recognition skills were included in the data of the

entire oral reading test, the number of pauses made within syntactic constituents by children reading orally could significantly discriminate between all three silent reading groups

Regardless of what criteria were used in analyzing the data, the less competent silent reading group always paused more often within syntactic constituents than did the more competent groups.

Hypothesis 3.20

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the number of pauses made within syntactic constituents while reading orally the first 70 syntactic constituents of the test,
>
> 3.21 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 3.22 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 3.21: When only the first 70 syntactic constituents were analyzed, and the effects due to lack of word recognition skills were eliminated from the data, the number of pauses made within syntactic constituents could not discriminate significantly between any of the three silent reading groups.

The children of varying silent reading abilities tended to perform very much the same in relation to the number of pauses made within syntactic constituents while reading orally if they knew the words in the passage, and if the passage was easy enough in terms of semantic and syntactic content.

Hypothesis 3.22: When the variable, number of pauses made within syntactic constituents was analyzed over the first 70 syntactic constituents, including data due to lack of word recognition skills, there was a significant difference between the means of the Above-average and Below-average readers; and also between the means of Average and Below-average readers. However, the differences in means which occurred between Above-average and Average readers when all the oral reading material was analyzed using this criteria, did not reach significance when only the oral reading material read in common by all the groups was analyzed.

Discussion of Hypothesis Three

Whether word recognition data were included or eliminated from the entire oral reading analyses, significant differences were always observed between Above-average and Below-average readers, and between Above-average and Average readers. Therefore, word recognition skills did not seem to be a consequential variable in determining the number of pauses made within syntactic constituents by children reading orally the progressively difficult material.

The removal of the word recognition data from the analysis of the less difficult material, however, did cause considerably different results. Number of pauses within synatctic constituents, on the first 70 syntactic constituents, could not discriminate between any silent reading groups when word recognition ability was eliminated.

Therefore, it would seem that the number of pauses made within syntactic constituents depends more on the semantic and syntactic difficulty of the reading material than on word recognition abilities. Unencumbered by lack of word recognition, the children are able to read the less difficult material with an apparently much more proficient application of the reading process. The removal of lack of word recognition abilities from the more difficult semantic and syntactic material, however, did not produce any variation in the results.

These data obtained on Hypothesis three seem to support Goodman's(1970) statement that the perceptual, syntactic and semantic information used in the reading process are used simultaneously and not sequentially; and also Brown's (1971) findings that 64 per cent of pause variance in oral reading can be predicted from syntactic measures.

Hypothesis 4.10

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the average length of pause made within syntactic constituent while reading orally the complete test,
>
> 4.11 when the effect of inadequate word recognition ability is controlled;
>
> 4.12 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 4.13 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 4.11: When word recognition abilities were controlled, and the entire oral reading data analyzed,

the variable average length of pause within syntactic constituent significantly discriminated between the means of Above-average and Below-average silent reading groups; and also between the means of Average and Below-average groups, but not between the means of Above-average and Average readers. In all cases, however, whether the differences between means were statistically significant or not, the more competent silent readers' pauses were always shorter in average length.

Hypothesis 4.12: When the effects of inadequate word recognition abilities were ignored completely throughout the entire oral reading test, the data revealed significant differences between the means of the Above-average and Below-average readers, and between the means of the Average and Below-average readerss, but the difference between the means of the Above-average and average silent reading group was not statistically significant.

Hypothesis 4.13: When the effects of inadequate word recognition ability were included in the data, and the entire oral reading material analyzed, the variable - average length of pause within syntactic constituent, could not discriminate significantly between any of the silent reading comprehension groups.

Considering the three criteria in Hypothesis 4.10, and the entire oral reading test, the variable average length of pause within syntactic constituent could not significantly discriminate between Above-average and

Average silent reading groups. It was, however, consistently able to discriminate significantly between Above-average and Below-average silent readers, and also between Average and Below-average, when word recognition abilities were controlled, or eliminated from the data. However, when word recognition abilities were included in the data, there were no significant differences between any of the groups. Since the inclusion of word recognition skills for each group cannot discriminate between the three silent reading groups, it appears from the data, that on this variable, the significant differences of the Below-average silent readers from either of the other two groups, is not primarily due to their lack of word recognition abilities, but to some other factor or factors that seem to be operating.

Hypothesis 4.20

> That Average readers, Above-average readers and Below-average readers do not differ significantly in the average length of pause made within syntactic constituent while reading orally the first 70 syntactic constituents of the test,
>
> 4.21 when the effect of inadequate word recognition ability is controlled;
>
> 4.22 when the effect of inadequate word recognition ability is eliminated from the data;
>
> 4.23 when the effect of inadequate word recognition ability is included in the data.

Hypothesis 4.21: When the first 70 syntactic constituents of the oral reading material were analyzed, and word recognition abilities controlled, significant differences occurred between Above-average and Below-average

readers, on the variable - average length of pause made within syntactic constituent, and also between Average and Below-average readers. However, the difference between the means of the Above-average and Average silent reading groups was not significant.

Hypothesis 4.22: When only the first 70 syntactic constituents were analyzed eliminating effects due to word recognition abilities, the same significant results were obtained: Above-average readers used significantly shorter average length of pause within syntactic constituents than Below-average readers; and Average readers used significantly shorter pauses within syntactic constituents than Below-average readers. But there was still no statistically significant difference between the means of the Above-average and Average readers' average length of pause within syntactic constituents, even though the average length of pause within syntactic constituents for the Above-average readers was always shorter than that of the Average readers'.

Hypothesis 4.23: When the effects of inadequate word recognition ability were included in the data, and the less difficult oral reading material was analyzed, the variable - average length of pause within syntactic constituent - could not discriminate significantly between any of the three silent reading groups.

The results of the analyses over the oral reading material read in common by all subjects were exactly the

same for all three criteria as they were when the entire oral reading material was analyzed. That is, average length of pause within syntactic constituent could discriminate significantly between all silent reading groups except between Above-average and Average, when word recognition abilities were controlled or eliminated, but could not significantly discriminate between any silent reading groups when word recognition abilities were included in the data.

Discussion of Hypothesis Four

This variable is unique in that its results are very consistent and seem to indicate very clearly that it is not lack of word recognition abilities, as such, that is the cause of the significant differences between the silent reading groups. When word recognition abilities are eliminated from the data, significant differences are evident, whereas when lack of word recognition abilities are included, the silent reading groups are not significantly differentiated at all.

The data on this variable seems to suggest that the Below-average silent readers (who were significantly different from the other two groups) do not seem to be organizing and processing the visual input of written language into meaningful cognitive units (such as a syntactic constituent).

Cromer (1970) gathered evidence on good and poor

adult readers reading silently, and found that one cause of their comprehension difficulty was the way in which some poor readers organize visual input of the material. The evidence of this present study based on the oral reading behavior of young children, seems to suggest that the organization of visual input is also a factor in the reading processes of young children.

Hypothesis 5.10

> That there is no significant relationship between the percentage of pause time used by children reading orally the complete test, and their oral reading comprehension scores.

When the entire oral reading material was analyzed, there was no significant relationship at any grade level, nor for the entire group, between oral reading comprehension scores and the percentage of time spent pausing while reading orally.

Hypothesis 5.20

> That there is no significant relationship between the percentage of pause time used by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

There was a low, but statistically significant relationship at the Grade three level only, between oral reading comprehension scores and the percentage of time spent pausing while reading orally, which occurred when the first 70 syntactic constituents of the oral reading material was considered.

Whether the entire oral reading material is analyzed, or only the first 70 syntactic constituents read in common

by all the children, on the balance, the amount of reading time spent in pausing, by children reading orally, does not seem to be related to their oral reading comprehension scores.

Hypothesis 6.10

> That there is no significant relationship between the period of time spent pausing within syntactic constituents by children reading orally the complete test, and their oral reading comprehension scores.

There was no significant relationship at any grade level, nor for the entire group, between oral reading comprehension scores and percentage of time spent pausing within syntactic constituents by children reading orally the entire oral reading test.

Hypothesis 6.20

> That there is no significant relationship between the period of time spent pausing within syntactic constituents by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

There was no significant relationship at any grade level, nor for the entire group, between oral reading comprehension scores and percentage of time spent pausing within syntactic constituents by children reading orally when the less difficult oral reading material was analyzed.

On both the entire oral reading test, and the first 70 syntactic constituents, there is no statistical evidence in this study to indicate any relationship between oral reading comprehension scores and the percentage of reading time spent pausing within syntactic constituents while

children are reading orally.

Hypothesis 7.10

> That there is no significant relationship between the number of pauses made within syntactic constituents by children reading orally the complete test, and their oral reading comprehension scores.

There were no significant relationships, at any grade level, nor for the entire group, between oral reading comprehension scores and the ratio of the number of pauses made within syntactic constituents to the number of opportunities to pause therein. All correlations were negative. That is, the trend was that the less the number of pauses made within syntactic constituents, the higher the comprehension scores tended to be.

Hypothesis 7.20

> That there is no significant relationship between the number of pauses made within syntactic constituents by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

An analysis of the first 70 syntactic constituents also indicated no significant relationship at any grade level, nor for the entire group, between the oral reading comprehension scores and the number of pauses made within syntactic constituents by children reading orally the less difficult material.

Hypothesis 8.10

> That there is no significant relationship between the average length of pause within syntactic constituent made by children reading orally the complete test, and their oral reading comprehension scores.

No statistically significant relationships existed between oral reading comprehension scores and the average length of pause made within syntactic constituents by children reading orally, when the entire oral reading material was analyzed.

Hypothesis 8.20

> That there is no significant relationship between the average length of pause within syntactic constituent made by children reading orally the first 70 syntactic constituents of the test, and their oral reading comprehension scores.

There was also no statistically significant relationships between oral reading comprehension scores and the average length of pause made within syntactic constituents by children reading orally, when only the first 70 syntactic constituents of the oral reading test were analyzed.

Discussion of Hypotheses Five, Six, Seven and Eight

The almost total lack of relationship between oral reading comprehension and any of the four pausing variables used in this study contrasts violently with the very obvious ability of these same four pausing variables to discriminate between Above-average, Average and Below-average silent reading comprehension groups.

These results could be artifacts of the two distinct methods by which comprehension was measured in the silent and oral reading tests (see Limitations of the Study - Chapter I).

The data analyzed in Chapter V seemed to point quite clearly to the fact that there was no relationship at all between oral reading comprehension scores and silent reading comprehension scores: many children who scored high on silent reading comprehension scored low on the oral reading comprehension test, while Below-average silent readers often scored high on the oral reading comprehension test. However, a close look at the details of the data (especially as tabulated in Table 5.2) seems to indicate that at the Grade two level particularly,the Below-average silent readers did not score very high on the oral reading comprehension test, while at the Grade three level, reading aloud did seem to improve the comprehension of the Below-average silent readers.

These data in Chapter V seem to suggest that young children who are not yet proficient silent readers may go through a variety of sub-skills before the model of a proficient silent reader reading orally may be applied to them (see Figure 2.3, page 53). The element of direct recoding from graphic input to oral output, as shown in this Figure, may be very much greater in the case of young children reading orally.

Since the data do indicate that the use of the pause phenomena in oral reading does differentiate significantly between silent reading comprehension groups, it seems that the model of silent reading shown in Figure 2.1 (page 49) appears to be correct, and that there actually may be

an element of aural language input in silent reading which assists in comprehension, even when reading silently.

However, when the child is asked to read orally, it appears from these data that there is no relationship between how he is processing his visual input (i.e. syntactic constituents), and the meaning he obtains from the passages. One assumption is that the child may be considered fairly proficient in silent reading (at least to the extent that the model shown in Figure 2.3, page 53 may be applied to him). If this is so, it seems that two things may be happening when the child is asked to read orally: (1) he obtains the meaning, as shown in Figure 2.3, but the process of trying to produce an acceptable oral output slows him down to such an extent that he forgets the content he is processing, or (2) because he knows he has to read orally, he has tended to concentrate too much on recoding directly from graphic input to oral output, and in this process has actually skipped the decoding to meaning, as shown in Figure 2.3. A second theory is that the child in Grade two and three is not actually a proficient silent reader, but is more apt to conform to the model shown in Figure 2.1, page 49. When this child is asked to read orally, the model shown in Figure 2.4, page 54 is more applicable. Thus, (1) in the process of recoding to aural input-oral output, and then decoding to meaning, the child is unable to finish the process by recalling what he

has "heard", either because he cannot remember, or because he neglected to recode to aural input. He recoded directly to oral output from graphic input, and did not "listen" to what he was reading; or (2) he stops the process at oral output, as shown in Figure 2.4, and does not even attempt to complete processing for meaning. He is, then, only able to grasp what little comprehension of the material he has obtained from the element of direct decoding from graphic input to meaning, as shown by the broken line in the model. This could account for the lack of relationship between how the child seems to be processing his visual input while reading orally and oral reading comprehension, while at the same time the actual silent and oral reading processes may be very similar (see Figure 2.1, page 49 and Figure 2.4, page 54).

Table 5.2, page 140 (Oral Reading Comprehension Scores by Silent Reading Group) indicates that almost half the Above-average silent readers in Grade two scored below 50 per cent on the oral reading comprehension test. At this grade level, the Below-average silent readers also tended to score Below-average on oral reading comprehension also.

The big difference, however, seems to occur at the Grade three level, where reading aloud seemed to improve the comprehension of the Below-average silent readers - 75 per cent of these Below-average Grade three silent readers scored above 50 per cent on the oral reading comprehension test. It seems that the younger children (in Grade two), and the poorer readers in Grade three, have learned

to "listen" to themselves, while reading orally, probably because they are still using a strong auditory component while reading silently also.

However, the Above-average silent readers in Grade three deterioriated in comprehension when asked to read orally. An explanation of this could be that, having become proficient silent readers, they do not recode to aural input, hence do not use their "auditory mode" while reading silently. They are, as Bever and Bower (1970) would label them, "visual readers". Therefore, when required to use the auditory mode, they become less proficient. In order to articulate aloud the reading material, these Above-average Grade three readers probably have to slow up their rate of processing the graphic input, and hence reading aloud becomes a hindrance to their comprehension, rather than a help, as it seems to be for the younger children and for the Below-average readers of comparable age-level.

<u>Hypothesis 9.10</u>

> That when the complete oral reading test is considered, there is no significant relationship between (1) the percentage of total reading time spent in pausing, (2) the period of time spent in pausing within syntactic constituents, (3) the number of pauses made within syntactic constituents, (4) the average length of pause within syntactic constituent, and
>
> 9.11 Auditory Memory Span for Digits Forward,
> 9.12 Auditory Memory Span for Digits Backward,
> 9.13 Visual Memory Span for Letters, and
> 9.14 Intelligence Quotients.

<u>Hypothesis 9.11</u>: There were no statistically significant correlations between auditory memory span for digits

forward and any of the four pausing variables mentioned in Hypothesis 9.10, at either grade level, or for the entire group.

Hypothesis 9.12: Correlation coefficients between all four pausing variables and auditory memory span for digits backward were very low, and none were statistically significant, at either grade level, or for the entire group.

Hypothesis 9.13: None of the four pausing variables used in this study showed any significant relationship to visual letter span, at either grade level or for the total group, when the entire oral reading test was analyzed.

Hypothesis 9.14: When the entire oral reading material was analyzed, there was a statistically significant and negative correlation between intelligence and two of the pausing variables (time spent pausing within syntactic constituents, and number of pauses made within syntactic constituents), but only at the Grade three level. At the Grade two level there were no significant correlations between intelligence and any of the four pausing variables when the entire oral reading material was considered.

Hypothesis 9.20

> That when the first 70 syntactic constituents of the oral reading test are considered, there is no significant relationship between (1) the percentage of total reading time spent in pausing, (2) the period of time spent in pausing within syntactic constituents, (3) the number of pauses made within syntactic constituents, (4) the average length of pause within syntactic constituent, and

9.21 Auditory Memory Span for Digits Forward,
9.22 Auditory Memory Span for Digits Backward,
9.23 Visual Memory Span for Letters, and
9.24 Intelligence Quotients.

Hypothesis 9.21: Correlations between the four pausing variables mentioned in Hypothesis 9.20 and auditory memory span for digits forward remained statistically insignificant, whether the data were analyzed over the entire oral reading material, or only over the first 70 syntactic constituents.

Hypothesis 9.22: Correlation coefficients between all the above-mentioned pausing variables and auditory memory span for digits backward were very low, and none statistically significant, even when only data from the first 70 syntactic constituents read in common by all the children in the test sample, were considered.

Hypothesis 9.23: When the less difficult oral reading material was considered, all four pausing variables correlated negatively and significantly with visual memory span for letters, but only at the Grade three level. For the Grade two children, there were no significant relationships between any of the four pausing variables mentioned in Hypothesis 9.20 and visual memory span for letters.

Hypothesis 9.24: When only the less difficult material was analyzed (the first 70 syntactic constituents), there was a negative and statistically significant correlation, at the Grade two level, between intelligence and two pausing variables: percentage of total reading time spent in pausing within syntactic constituents, and average

length of pause within syntactic constituent.

Discussion of Hypothesis Nine

At first sight, the data from Hypothesis nine seems to indicate no relationship between memory span and the processing of written language, at least in so far as the pausing variables used in this study are indicators of the reading processes being used.

However, a closer inspection of the data from the present study suggests that such a relationship between the processing of written language and memory span is something that develops or is learned, but is not present in the processing of written language by very young children. These data seem to indicate that toward the end of Grade three,the child is beginning to use short term memory to process written language, in a way similar to that used by adults in studies by North and Jenkins (1951), Cromer (1970) and Smith (1971). At the Grade three level, all four pausing variables correlated significantly and negatively with the visual memory span test, but only when the less difficult oral reading text was analyzed (first 70 syntactic constituents). That is, the less use of the pause, or pausing within syntactic constituents, the longer the visual memory span. The child seemed to be able to remember more if he could group in meaning units (and not pause within syntactic constituents). This finding also supports the evidence of Miller (1956), and Ryan (1969).

Contrary to the research results of Sperling (1960, 1963), Wickelgren (1965) and Neisser (1967), whose work with adults indicated very strongly that visual stimuli were stored auditorily, there were no significant relationships in this study, at either grade level, between the two auditory memory span tests and any of the four pausing variables. But perhaps this also is a later-developing skill, or a learned skill, not possessed by young children, and developing even later than the Grade three level.

Intelligence did show some significant and negative relations to how children use pausing in oral reading. At the Grade two level, this relationship could only be observed when the less difficult oral reading material was analyzed, but not if the entire oral reading text data were used. The two variables at the Grade two level, which were significantly related to intelligence were: percentage of total reading time spent in pausing within syntactic constituents, and average length of pause within syntactic constituent. These variables became smaller as intelligence increased.

At the Grade three level, on the entire test, the relationship between intelligence and time spent pausing within syntactic constituents,and number of pauses made within syntactic constituents, were negatively and statistically significant. Children with higher intelligence tended to pause less often within a syntactic constituent. How a child processes written language does seem to have

some relationship to the intelligence of the child, although the age of the child, and the difficulty of the material is also closely tied in with this relationship. When the oral reading text became increasingly difficult, and the children were younger, intelligence did not appear to relate significantly to the pausing phenomena. It may be that these younger children, when trying to read the more difficult material, were directing most of their attention and effort to recoding the visual symbols to phonemes, rather than decoding them to meaning.

Hypothesis 10.00

> That there is no significant main effect due to silent reading group, grade, or sex, on
>
> 10.10 Auditory Memory Span for Digits Forward,
> 10.20 Auditory Memory Span for Digits Backward,
> 10.30 Visual Memory Span for Letters, and
> 10.40 Intelligence Quotients.

Hypotheses 10.10, 10.20, and 10.30: The three-way Analysis of Variance, grouping according to silent reading group, grade and sex, revealed no significant main effects due to the reading group, grade, or sex, on the variables - auditory memory span for digits forward, auditory memory span for digits backward, and visual memory span for letters.

Hypothesis 10.40: There was a significant main effect due to silent reading group (but not to grade or sex), when the intelligence quotient variable was analyzed. The children in the Above-average silent reading group had significantly higher intelligence quotients than did those in the Average or Below-average groups.

Discussion of Hypothesis Ten

The tests for memory span used in this study did not discriminate between the silent reading comprehension groups, the grade levels, nor between the sexes.

Tables 6.1, 6.2 and 6.3 (pages 171, 173 and 176) indicate that the variances of group, grade and sex in the test sample are very small. The variance of the silent reading groups in this study was large, by reason of the design of the study itself. Therefore, an Analysis of Variance on these very small differences in memory spans would almost certainly be non-significant.

An additional conclusion based on Hypothesis Ten could be that Above-average silent readers may comprehend better because they possess significantly higher intelligence quotients than do the other two groups of silent readers. Intelligence, however, cannot account for the differences in comprehension scores between Average and Below-average readers.

Hypothesis 11.00

That there is no significant main effect due to oral reading group, grade, or sex, on

10.10 Auditory Memory Span for Digits Forward,
10.20 Auditory Memory Span for Digits Backward,
10.30 Visual Memory Span for Letters, and
10.40 Intelligence Quotients.

Hypotheses 11.10, 11.20, and 11.40: The three-way Analysis of Variance, grouping according to oral reading comprehension group, grade,and sex, revealed no significant main effects due to reading group, grade,or sex, on

the variables - auditory memory span for digits forward, auditory memory span for digits backward, and intelligence.

Hypothesis 11.30: The three-way Analysis of Variance, which grouped according to oral reading comprehension group, grade, and sex, indicated a significant main effect due to group, when the variable visual memory span for letters was analyzed.

There was a significant difference between the means of the First and Second groups of oral readers. The table of means (Table 6.3, page 176) reveals that this difference occurred only at the Grade three level, since the means of the First and Second groups in Grade two were exactly the same. The First group of oral readers in Grade three had significantly shorter visual memory spans for letters than did the Second group.

There were no significant main effects due to grade or sex.

Discussion of Hypothesis Eleven

Even though the variance of the oral reading groups was not nearly as large as that of the silent reading groups (and the mean square within in an Analysis of Variance would be much smaller), neither of the auditory memory span tests, nor intelligence, could differentiate between the oral reading groups. Table 6.4 (page 181)reveals why intelligence could not differentiate between oral reading groups, whereas it could differentiate the silent reading groups (Table 3.3, page 66). Although there was still a

difference between oral reading groups in intelligence, these differences were not as great as they were between silent reading groups.

Visual memory span for letters, however, could differentiate between oral reading groups, but the difference was significant only between First and Second groups of oral readers, and only at the Grade three level. It seems then, that not until near the end of Grade three are the children beginning to use visual memory span to organize their visual input of written language in a way similar to that of adults (Wilkes and Kennedy, 1968)

IV. LIMITATIONS OF THE FINDINGS

In addition to the limitations recognized at the beginning of this study, certain other limitations became evident as the study progressed.

While it was recognized that there were major differences between the measurements of oral and silent reading comprehension, the extent to which this diversity in the two measurements may have limited the interpretation of the reading comprehension data was not appreciated.

A further limitation of the findings was the fact that the oral reading groups were not able to be divided on the basis of oral reading comprehension as stringently as were the silent reading groups. If there had been more variance (or at least as much variance) in the oral reading comprehension scores, as there was in the silent

reading comprehension scores, perhaps the results would have been different.

V. IMPLICATIONS AND SUGGESTIONS

For Reading Theory

The pausing phenomena and how it is used by young children processing written language while reading aloud, appears to have especial importance in the study of reading theory, in that these timing cues (pauses) seem to be able to differentiate between the silent reading comprehension abilities of children.

Above-average silent readers always used fewer and shorter pauses within syntactic constituents while reading orally, than did either Average or Below-average readers, while Average silent readers, in turn, always paused less often and for shorter periods within syntactic constituents when reading orally than did Below-average readers. This pattern would seem to indicate a parallelism between the silent reading processes and the oral reading processes of young beginning readers who have been exposed to reading instruction for not more than 2.5 years. It further reinforces one of the basic assumptions of this study, and also the hypotheses of Pival (1971), Goodman (1968), and McCracken (1967) that the silent reading processes of young children learning to read are similar to their oral reading processes.

The products of these processes, however, (or the comprehension of the text) did not appear similar in the

two situations - silent reading and oral reading. There was no significant relationship between silent reading comprehension scores, and oral reading comprehension scores, as measured by the tests used in this study. In addition, there was no significant relationship between children's use of the pause while reading orally, and their oral reading comprehension.

Since there did not seem to be any relationship between pausing in oral reading, and oral reading comprehension scores, it may be that the effort and attention needed by the young beginning readers to produce a phonetic string was sufficient to distract them from the semantics of the passage. While reading orally, the child not only has to recognize and process the syntactic structure and visual patterns, but also coordinate their occurrence with the production of appropriate articulatory gesticulations. It appears that this added dimension of oral reading is enough to interfere with the meaning of what he is asked to read aloud.

It seems then, that although an observation of where pauses occur in an oral reading output may be a good indication of the reading "processes" employed by young children, silent reading is a better instrument to use if the "product" (or comprehension) is to be observed.

The data suggests that when young children are required to produce an acceptable oral reading of a text, they either recode the orthographic string of the text to oral

output, without first decoding to meaning, and thus omit the most necessary step of the reading process; or they decode to meaning, but in the process of articulating aloud the passage being read, forget the content of what they are trying to process.

Oral reading does, however, seem to assist Below-average older readers (Grade three), and all the younger readers (Grade two), to comprehend what they are reading, but not significantly so. These readers seem to find help in the auditory feedback, or auditory component of their reading processes, while older and more capable readers tend to find this component a hindrance, rather than a help to their comprehension. It would appear that for the younger and less able readers, the feedback which they get from their own voices is an asset to them in remembering the content, whereas for the older and more proficient readers, the oral reading of a passage necessarily slows them down, and thus interfers with their comprehension. Or it could be that these older and better silent readers, when reading orally, are processing written language similar to the model shown in Figure 2.3, page 53, but even though these children are more proficient silent readers, they are tending to recode directly from graphic input to oral output when asked to read orally, and thus are skipping the most important step - the meaning. The younger, and less proficient silent readers, appear to be reading orally similar to

the processes shown in Figure 2.4, page 54. Hence, although they are producing the phonetic output at a slower rate, and with many more pauses, they are nevertheless getting more meaning out of the reading than are those who are more proficient silent readers, and faster oral readers. The meaning, or comprehension of the oral reading material, for these less efficient silent readers, comes after the oral output is produced. Although a less efficient method, nevertheless, the feedback from the oral output, plus the fact that meaning comes at the end of the process, enables these less efficient readers to comprehend and to remember what they are reading.

It would appear, then, from the evidence in this study, that the better silent readers are impeded by the added necessity of producing appropriate articulatory gestures, whereas for the younger and less efficient readers, such a performance provides reinforcement and feedback to assist in the comprehension of the material.

In addition, since the measurement of pauses within syntactic constituents was able to differentiate between the various silent reading groups used in this study, it is quite probable that the syntactic constituent, as defined in this study, is a functional linguistic and cognitive unit in the perception of written language, at least in so far as the test sample is concerned. This finding confirms the second assumption made in this study, and also the work on the perceptual unit of written language

done by Smith (1971), VanUden (1970), Cromer (1970), Kolers (1970), Neisser (1967), Goodman (1967), and North and Jenkins (1951). All of these researchers, except VanUden and Goodman, were concerned with adult readers. VanUden was interested primarily in deaf children. Goodman's belief that an essential reading strategy of children is the recognition of phrases and larger sequences seems to prove correct, especially in so far as it concerns the young beginning readers in the present test sample.

Wilkes and Kennedy (1970), Martin, Kolodziez and Genay (1971), and Brown (1971) found evidence that for adult readers, syntax and placement of pauses were closely related. The present study confirms this finding in relation to young children learning to read. Those children who obtained the highest comprehension scores when reading silently were those children who were least apt to fracture a syntactic constituent by pausing within it. The results of this study suggest a very close relationship between the surface structure of the reading material, the number and length of the pauses used while reading orally, and the silent reading comprehension ability of the reader. It would seem then, that pausing in oral reading could be used to contribute to insights into whether a reader is able to simultaneously process the syntactic and semantic content of a passage, which may be the "linguistic sophistication" referred to by Chomsky and Halle (1968, page 50), and which they contend is

necessary for acceptable oral reading.

The data obtained in this study also seems to indicate that the semantic and syntactic difficulty of the reading material has more bearing on the ability of the children to comprehend the material, than does their ability to recognize the words. Word recognition ability, however, appeared to exercise more influence in significantly discriminating between oral reading comprehension groups than when these word recognition abilities were analyzed in relation to the silent reading comprehension groups. Word recognition abilities were also not able to account for the significant differences in the use of the pause while reading orally, which occurred between Grade two and Grade three. The younger children's comprehension problems, and their longer and more numerous pausing while reading orally may be due more to the syntactic and semantic difficulty of the material they are asked to read, rather than to their word recognition abilities.

However, the pausing phenomena of the children cannot be attributed solely to the syntactic and semantic difficulty of the passage, since at each grade level, even on the less difficult material, with word recognition abilities removed from the data, the Above-average silent readers were still using less pause time within syntactic constituents while reading orally, and the Below-average silent readers were using the most. The pausing phenomena then, could be the result of the actual reading

processes used by the children, rather than their ability to recognize words, or than the semantic and syntactic difficulty of the material. The Above-average readers appear to be using a more efficient phase of the reading process. Further, the differences observed in this study between the Above-average and Average silent readers' use of the pause in oral reading, were not nearly so great as those between Average and Below-average readers. In addition, the performance of the Below-average readers seemed to deteriorate, rather than improve, as they progressed from Grade two to Grade three.

Significant contributions to the effectiveness of reading, arranged in order of rank as determined by the data in this study, seem to be: the efficiency of the reading process used by the child, the syntax and semantics of the material to be read, and lastly, the word recognition skills of the reader.

Findings obtained in this study seem to indicate no relationship between oral reading comprehension and silent reading comprehension.Although the "processes" of oral and silent reading (as determined by how the use of the pause in oral reading can discriminate between silent reading ability groups) appear to be similar in young children, the "products"(or comprehension of the material) are not. In any theory of reading then, it would be absolutely necessary to keep distinct the "process" and the "product". Any confusion of these two aspects of reading would seem

to nullify the theory.

This study also revealed that longer auditory memory spans do not seem to indicate better comprehension in either oral or silent reading. In fact, auditory memory spans were very similar for all groups (at both grade levels, and in silent and oral reading groups), and were not significant factors in either the oral or silent reading comprehension groups. But at the Grade three level, there was a significant relationship between silent reading comprehension and memory span for digits backwards. There appears to be some additional skill in silent reading that is related to the skill needed to remember digits backward. This could involve aspects of remembering, analyzing and synthesizing. Since no significant relationship occurred at the Grade two level between auditory memory span for digits backward and comprehension scores, these skills may be developmental and contain factors which have an influence on comprehension.

As far as reading theory is concerned, there appears to be a very important developmental stage which occurs at the Grade three level, and which takes precedence over the difficulty of the reading material and word recognition abilities. At the Grade three level, several factors occurred that were not present at the Grade two level: 1) silent reading comprehension and memory for digits backward were significantly related, 2) oral reading comprehension was significantly related to intelligence,

3) there was a significant relationship between all the four pausing variables used in the study and visual memory span for letters on the less difficult oral reading material, 4) the number of pauses made within syntactic constituents (which was the most consistent discriminator of silent reading groups), was always less for the Grade three children, when either silent or oral comprehension groups were compared across the grade levels, and 5) when the children in the sample were grouped according to oral reading comprehension ability, sexes became equalized within groups at the Grade three level. All these data seem to re-emphasize that the ability to process written language is a developmental process. It is a recognized psychological fact that children develop at various rates for various reasons. Further, the way the children in this study used the pause, and their competency in doing so, increased from Grade two to Grade three consistently, regardless of intelligence, word recognition abilities, or the difficulty of the material read.

For Reading Research

The findings obtained from the data in this study have raised questions, the answers to which may provide important contributions to research in the field of reading.

An attempt could be made to study the actual use of the pause in silent reading, and silent reading processes, by using the newest type of eye-camera, which is able to locate a visual fixation of a given length of time, at a

precise point in the text. These pauses could then be related to silent reading comprehension. This would be particularly effective if the comprehension scores were obtained from the same text used to measure the pausing phenomena in a silent reading performance; that is, if the comprehension was tested immediately after the subject read the material from which the eye-camera film was made.

Another version of eye-voice span experiments might be to have the children in the sample divide a text into word groups, by asking them to read it silently, and draw perpendicular lines where they think the pauses should be located. Then, at a later date, have these same children read the unmarked text aloud and compare their actual oral production with what they had previously indicated as places of pause.

A study similar to the present study, but in which more control was exercised over the oral reading comprehension groups, might reveal some interesting results. That is, to divide the population on the basis of oral reading comprehension as stringently as this investigation divided into groups of Above-average, Average and Below-average readers on the basis of silent reading comprehension. Perhaps if there was more variance in the oral reading scores, there would have been more significant relationships to silent reading comprehension, and also to how the children used the pausing phenomena in oral reading.

Further research attempting to relate oral and

silent reading processes and comprehension ability could provide silent reading tests that would test comprehension in the same way that oral reading comprehension was testted. This could include a matched control and experimental group, consisting of one group reading a text silently, and then being asked the comprehension questions orally, to which a verbalized reply would be essential. The other group would be given the same text to read orally, and comprehension tested in the same way. Reading processes would have to be tested at a later date, all children in both groups, reading the same version of some text, and the pausing phenomena measured as in this present study.

The pause (or juncture) is only one aspect of the entire suprasegmental system. Perhaps further research, based on this study and using the same, or similar instrument for obtaining objective measurements, could be initiated, using the suprasegmental phonemes of pitch and/or stress as the dependent variable(s).

The Esterline Angus Speedservo labgraph might also prove to be a valuable instrument in the diagnostic and research activities conducted in a Reading Clinic situation.

Much more research needs to be done in the area of memory span and the processing of written language in young children. The research to date has entailed adult subjects, or older children, but there seems to be no research in this area which employs young, beginning readers as subjects.

<u>For Teaching Reading</u>

The findings of this study have convinced the investigator that much more emphases should be placed on the language component in teaching reading - that is, especially the syntax of the language and how words relate to one another, rather than on the recoding aspect of reading, which emphasizes word recognition skills. It seems that this could best be done by using the written component of the actual oral language patterns of the children. That is, using visual displays of the child's own language as the bases for reading instruction, rather than text books.

The data imply the need for teaching specific ways and means of using the pause effectively in spoken language, in the primary grades. That is, clustering the words into proper speech units and uttering each unit as a single sequence of articulate sound. This awareness of the most effective use of the pause in oral language could be carried over into beginning the teaching of reading. Children could be taught to realize the importance of the suprasegmental feature of juncture (or pause) in speaking (and eventually in reading), and a systematic effort made to teach this feature, especially by means of oral exercises.

In the teaching of reading, groups of words, separated by pauses could be taught as a unit, before other reading behaviors (i.e. too much emphasis on individual words which leads to word by word reading) have been established. Since the results of this investigation

reveal a significant relationship between the pause phenomenon in oral reading and silent reading comprehension, then in the teaching of reading, systematic lessons on an awareness and correct use of the pause may increase the children's comprehension of written material.

This of course means, that even at the beginning stages of learning to read, the children must be made aware of the various punctuation marks in written language, and how they effect comprehension. Further, it would be necessary to teach children the exceptions - that punctuation marks do not always indicate pauses, and that good reading sometimes calls for many more pauses than there are punctuation marks. Conversely, punctuation marks, especially commas, do not always require a pause in order to comprehend.

This study has shown that children who scored low on silent reading comprehension tended to combine syntax (or syntactic constituents), and timing cues (pauses), which were inappropriate to each other. In addition, the data also indicated that adequate comprehension in silent reading was possible without thorough word recognition skills. When word recognition abilities were controlled or eliminated entirely from the data, Above-average silent readers and Below-average silent readers could still be differentiated by the pausing variables 67 per cent of the time. In well over half the data collected on the silent reading groups and pausing variables, factors other than word recognition abilities appear to be contributing

more directly to comprehension ability. One of these, of course, is how the children are using the pause, or how they appear to be grouping their visual input. These data suggest strongly what Goodman (1970) and Weber (1968) have already proposed - that more emphasis should be placed on teaching words as linguistic units, or on the syntactic structure of the reading text, rather than on words as such.

Although it is of course necessary to have some word recognition skills in order to read, nevertheless word recognition abilities as such, were shown to be fairly unimposing in comprehending silent reading material. It seems that more emphasis on the syntactic structure of the written symbols - preferably the transcribed oral language of the children who are learning to read - would perhaps produce more efficient and effective silent reading comprehension. Using the child's own syntax to teach reading may possibly create not only efficient "processes", but also adequate "product" - comprehension. On the other hand, emphases on word recognition and oral reading, may very well only produce well-defined articulatory gestures.

The investigator also feels that although oral reading may be used as an indication of how the child is processing written language, nevertheless it may not be an accurate indication of how well he may be comprehending silent reading material. It appears,from the silent reading comprehension scores and the analyses of the way children use pausing in oral reading, that the silent and oral reading processes used by young children may be very

similar. However, the product of these processes (comprehension) seems to depend on whether the child is asked to read silently or orally. Oral reading then, may give clues as to what reading processes the child may be using (especially to indicate whether he is processing the written language in meaningful units). However, it seems not to be an accurate indication of how well a child can comprehend what he reads silently. Since comprehension is the ultimate goal of reading, then oral reading does not appear to have any merits in attempting to teach or to test comprehension. Further, the child's hesitancy in oral reading due to lack of word recognition skills, is no indication of his silent reading comprehension abilities. The data revealed that the additional component required to read aloud - to coordinate the articulatory gestures with the processing of the syntax and timing cues - produced opposite effects in readers of varying abilities. Therefore, oral reading should not be either condemned or condoned, but used to produce the best comprehension results. The comprehension of adequate silent readers seemed to be inhibited when these children were asked to read aloud - probably because this oral production slowed down their comprehension processes. On the other hand, reading orally appeared to facilitate comprehension for the Below-average Grade three readers and for the younger children (all the Grade two's). Therefore, the data again point up the fact of individual differences, and the necessity of fitting the appropriate teaching technique to the

individual child. What might produce good results for one group of children, may produce the opposite result with another.

Oral reading, then, might be used as a diagnostic tool to enable the teacher to determine how the child is processing the material that he is asked to read silently. Although oral reading also provides information on word recognition abilities, and although some word recognition abilities are necessary to read silently, nevertheless, very proficient accuracy in word recognition does not seem to be essential to good silent reading comprehension. Unless the teacher is prepared to diagnose the processes used by the child while reading, and is ready to attempt to teach him more efficient processes, then oral reading, especially for Above-average and Average readers, at the Grade three level, does not appear to be necessary.

The data indicate that towards the end of third grade, children are beginning to organize their visual input of written language in a way similar to that of proficient adult readers, but this trend is just beginning to emerge. The better readers, it seems, are beginning to change their reading processes and to read "meaning" rather than words or groups of words. However, since this more proficient reading process is just beginning to make an appearance at this level, the teachers of Grades three and four should be aware that such a transition is taking place. It would, therefore, seem that very competent teachers of reading are necessary at these grade levels,

in order to teach the most effective and efficient way of processing written language.

Teacher-training institutions should acquaint prospective teachers of such changes in strategies at these grade levels, and train the teachers how to help the children to make this transition with the most efficient and effective methods.

The differences between the comprehension scores of the sexes were non-significant. But at the Grade two level, many more girls than boys obtained higher oral reading comprehension scores. It was not evident why this should be so. Nevertheless, teachers should be aware of the fact that even though the small boys may not appear to read orally as well as the girls, they may comprehend what they read silently as well as the girls do.

Finally, whether children were grouped according to silent reading comprehension scores, or oral reading comprehension scores, the Below-average (or Third group) always possessed longer auditory memory spans for digits forward than did the Above-average (or First group). Auditory memory span for digits forward relies heavily on rote memory. Children who scored lowest on comprehension in this study seemed to possess the best rote memories. It may be that these children tend to rely too specifically on this type of learning. Hence, teachers should be aware of this, and teach "thinking" skills for reading comprehension, rather than asking comprehension questions that would entail too much rote memory. That is, the questions on

reading material to determine comprehension should be carefully thought out, so that the child will have to really think through his answer and not merely rely on his short-term memory.

VI. CONCLUDING STATEMENT

This study investigated the various pausing phenomena used by young beginning readers while reading orally, and the relationship of these phenomena to both silent and oral reading comprehension.

The pausing phenomena were measured by a process that was both objective and repeatable.

The data have provided additional insights into the reading processes used by young children learning to read, and has also led to further questions which might profitably be examined in the field of research in reading.

In conclusion, it can be said that the way children use the pause in oral reading is one indication of how they may be processing the written symbols. The measurement of the pause used in this study could be recommended to clinicians, reading specialists, or researchers in the field of reading, to provide further understanding of the reading processes used by children.

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APPENDIX A

WORD RECOGNITION TEST

WORD RECOGNITION TEST

C-1
- the
- girl
- has
- a
- cat
- is
- Mary
- Puff
- gray
- father
- in
- yard
- works
- hard

C-2
- big
- brother
- her
- name
- Dick
- helps
- his
- they
- take
- care
- of
- does
- not
- she
- talks
- to
- mother
- will
- walk
- store
- perhaps
- go
- with

C-3
- just
- twelve
- years
- old
- fourteen
- both
- same
- school
- grade
- seven
- likes
- class
- cooking
- now
- nine
- although
- he
- enjoys
- all
- art
- best

C-4
- for
- family
- prepares
- delicious
- meals
- them
- on
- certain
- holidays
- special
- foods
- which
- are
- favorites
- warm
- summer
- season
- there
- are
- numerous
- picnics
- back
- often
- builds
- fire
- these
- outdoor
- assist
- by
- gathering
- wood
- entire
- insists
- that
- tastes
- much
- better
- when
- and
- eaten
- fresh
- air

C-5
- exciting
- two
- attended
- boy
- scout
- camp
- located
- beside
- sparkling
- mountain
- lake
- where
- healthy
- living
- among
- activities
- improve
- their
- swimming
- sometimes
- sailing
- most
- important
- extended
- trips
- hopes
- return
- coming
- this
- last
- July
- thrilled
- was
- day
- weeks
- remembers
- instruction
- nature
- study
- especially
- probably
- overnight
- first
- time
- next

C-6
- supervises
- repair
- department
- large
- garage

also
trained
mechanic
specializing
electrical
system
car
who
job
frequently
taken
Saturday
mornings
during
visits
taught
about
construction
automobiles
thus
preparing
son
daughter
time
possess
drivers
licenses
wisely
familiarity
basic
mechanism
absolutely
essential

person
wishes
develop
intelligent
after
into
able
completed
high
C-7
have
always
encouraged
children
adept
some
form
athletics
quite
small
principles
baseball
participated
little
league
while
elementary
currently
catcher
junior
team
least
major

game
every
must
undertake
long
excursion
nearest
city
occasion
acquired
facility
quite
young
prior
age
fear
water
because
patience
constant
encouragement
confidently
before
sixth
birthdays
C-8
spite
youth
occasionally
thinks
future
vocation
only

vaguely
aware
problems
encountered
combining
career
marriage
would
however
equipped
useful
occupation
explore
various
employment
possibilities
course
sewing
might
lead
career
dietician
economics
instructor
home
consider
becoming
secretary
typing
other
business
offered
therefore

postpone
must
until
bookkeeping
stenography
third
possibility
might
become
kindergarten
teacher
any
case
counselor
advise
plan
judiciously
happy
future
useful

<u>C-9</u>

scientific
discovery
advancing
technology
continuously
altering
world
which
adults
inventions
undreamed
decade
become
realities
these
turn
obsolete
example
prepares
field
maintenance
employ
tools
procedures
efficiency
appear
precision
quite
should
stenographer
current
equipment
improvement
entire
communication
process
radically
affect
responsibilities
demands
skills
shorthand
employed
frequently
less
typing
indispensable
vary
rapid
advance
dictating
equipment
supervisor
touching
button
secure
data
central
location
several
miles
away
telephone
conversations
processed
instantaneously
records
kept
microfilm
cumbersome
files
formerly

throughout	increase	volume
indeed	enormously	speed
machines	accuracy	accomplished
continue		

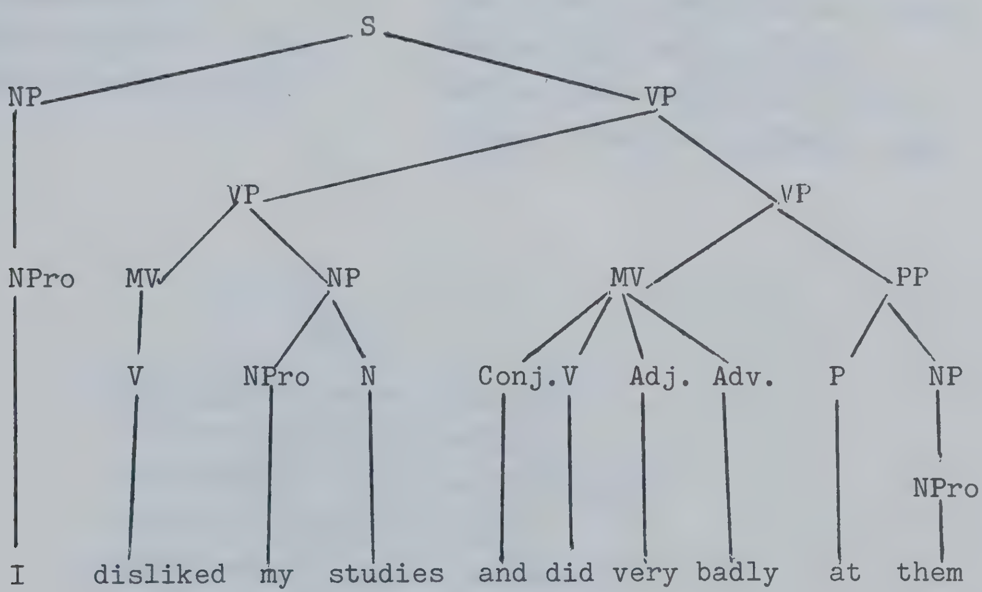
APPENDIX B

SYNTACTIC CONSTITUENTS

SYNTACTIC CONSTITUENT

The term "Syntactic Constituent" will refer to the lowest major constituent as defined by Latham (1971). It may be formed from all labelled nodes in a surface structure tree. These constituents are found by locating those nodes which are immediately above the lexical nodes and deciding whether or not there are sister-nodes to the lexical nodes. If there are no sister-nodes to a specific lexical node, then the node immediately dominating that lexical node is a lowest major constituent. If there are sister nodes to a specific lexical node, then the lowest major constituent associated with that node is the node which immediately dominates all sisters of the lexical node in question.

Example: I disliked my studies and did very badly at them.



Lexical nodes: I disliked my studies and did very badly at them

Sister nodes: (1) my studies
(2) and did very badly

The lowest major constituent associated with the sister-nodes is the NP node for (1) and the MV node for (2)

Gilmore Oral Reading Test

Divided Into

Syntactic Constituents

C-1

The girl/has/a cat./
The girl/is/Mary./
The cat/is/Puff.//
Puff/is/gray./
Father/is/in the yard./
Father/works hard./

C-2

Mary/has/a big brother./
Her brother's name/is/Dick./
Dick/helps/his father./
They/take care/of the yard./
Mary/does not work/in the yard./
She/talks/to her cat,/Puff. /
Mother/will walk/to the store./
Perhaps Mary/will go/with her./

C-3

Mary/is/just twelve years old./
Her brother/Dick/is/fourteen./
They both/go to/the same school./
Mary/is/in Grade Seven./
She/likes/her class/in cooking./
Dick/is now/in Grade Nine./
Although he/enjoys/all his school work,/
Dick/likes/the work/in art class/best./

C-4

Mother likes to cook for her family. She prepares delicious meals for them. On certain holidays she cooks special foods which are family favorites. In the warm summer season there are numerous picnics in the back yard. Father often builds the fire for these outdoor meals. Mary and Dick assist him by gathering wood. The entire family insists that food tastes much better when it is cooked and eaten in the fresh air.

C-5

Summers are exciting for Mary and Dick. For two years Dick has attended a Boy Scout camp. The camp is located beside a sparkling mountain lake where the boys enjoy healthy outdoor living. Among numerous activities, the boys improve their swimming, sometimes go sailing, and — most important — go on extended camping trips. Dick hopes to return to camp this coming summer. Last July Mary was thrilled when she attended a Girl Scout day camp for two weeks. She remembers the swimming instruction, the nature study, and especially the campfires. Mary will probably attend overnight Scout camp for the first time this next summer.

C-6

Mary and Dick's father supervises the repair department of a large garage. He is also a trained mechanic specializing in the electrical system of the car. Father, who enjoys his job, has frequently taken Mary and Dick to the garage on Saturday mornings. During these visits he has taught them much about the construction of automobiles. Thus he is preparing his son and daughter for the time when they will possess drivers' licenses. Father wisely insists that familiarity with the basic mechanism of an automobile is absolutely essential for a person who wishes to develop into an intelligent driver. Dick hopes that he, too, will be able to work on automobiles after he has completed high school.

C-7

Mother and Father have always encouraged their children to be adept in some form of athletics. When Mary and Dick were quite small, Father instructed them in the principles of baseball. Dick participated in Little League activities while in elementary school; currently he is catcher for the junior high school baseball team. The entire family attend at least one major league game every summer although they must undertake a long excursion to the nearest large city for this occasion. Mary and Dick also acquired swimming facility when they were quite young. Even prior to the age of two they were taught not to fear the water. Because of Father's patience, and especially because of his constant encouragement, Mary and Dick were swimming confidently before their sixth birthdays.

C–8

In spite of her youth, Mary occasionally thinks of her future vocation. She is now only vaguely aware of the problems encountered by all girls combining a career and marriage. Mary would like, however, to be equipped for a useful occupation before she is married, and during her years in junior and senior high school she will have an opportunity to explore various employment possibilities. Her seventh grade course in cooking and sewing might lead to a career as a dietician or as a home economics instructor. Mary might also consider becoming a secretary; she may study typing in the ninth grade. Other business courses are not offered prior to the tenth grade; therefore Mary must postpone until senior high school her study of bookkeeping or stenography. There is a third possibility that Mary might become a kindergarten teacher. In any case, the school guidance counselor will advise Mary and help her to plan judiciously for a happy and useful future.

C–9

Scientific discovery and advancing technology are continously altering the world in which Mary and Dick will work as adults. Inventions undreamed of a decade ago have become realities but these in their turn will become obsolete. If Dick, for example, prepares for the field of automobile maintenance, he will employ tools and procedures which—in their efficiency and precision—will make his father's current equipment appear quite crude. Should Mary become a stenographer, the improvement in the entire communication process will radically affect her responsibilities and the demands on her skills. Shorthand is now employed less frequently than before, and although typing may always be indispensable, its use will vary with the rapid advance in dictating equipment. Mary's supervisor can, by touching a button, secure data from a central location several miles away. Telephone conversations can be processed almost instantaneously. Records are kept on microfilm rather than in the cumbersome files which were formerly used. Throughout the world of work, and indeed throughout life, machines will continue to increase enormously the accuracy, volume, and speed of the work which is accomplished.

APPENDIX C

TRIAL SENTENCES CONTAINING SYNTACTIC CONSTITUENTS

TRIAL SENTENCES CONTAINING SYNTACTIC CONSTITUENTS

1. I can see the dog. __________ __________
2. It is black and white. __________ __________
3. The cat is called Muff. __________
4. Bob has a sister. __________
5. Bob and Jane are here. __________ __________
6. They play in the yard. __________ __________
7. The baby is two years old. __________ __________
8. He plays with his mother. __________ __________
9. Spot runs after the ball. __________ __________

Total msec: $\dfrac{\rule{3cm}{0.4pt}}{16}$ = criterion pause

Significant pause: __________ x 2.5 =

APPENDIX D

TECHNICAL INFORMATION

ESTERLINE ANGUS SPEEDSERVO AZAZ LABGRAPH

TECHNICAL INFORMATION

ESTERLINE ANGUS SPEEDSERVO AZAZ LABGRAPH

Description

The Speedzervo is a null-balancing potentiometric graphic recorder designed for industrial, laboratory, and general field applications. Its high DC sensitivity, fast response, and interference-free operation make it one of the most useful and reliable instruments in the field of data acquisition (Manual, p. E-2)

The small feedback winding mounted on the amature provides a true-velocity feedback system. Voltage output of this coil, as it cuts through the permanent-magnet flux field, is directly proportional to speed of the armature. This renders unusually tight control essential in a high spped system, and improves reliability through circuit simplification. Input signal of the preamplifier module, passes through a 60-cycle rejection filter to minimize stray AC pickup. The machine circuitry is completely integrated into the basic recorder feedback circuit, so that it can maintain a potentiometric input throughout its adjustment range. The gain and damping controls are automatically adjusted with the span so that optimum response characteristics are maintained as span is changed.

Electrical Adjustments

Zero Adjustment: this control offers full-span adjustment of the pen position, and may be used to re-set the null or rest position of the feedback potentiometer. The Zero Adjust controls include the following:

(a) Supression-Elevation Switch - this switch allows the user to offset the recorder's electrical zero in either direction from the left-hand side of the chart by the amount set on the control knobs.

(b) Decade Switches - two concentric decade switches provide calibrated steps of zero adjustment. The outer knob in 10 MV steps and the inner knob in 1 MV steps.

(c) 0-1 MV Calibrated Potentiometer - the final increment of voltage is obtained by adjusting a precision 10-turn potentiometer. This potentiometer has setability and resolution to .0015 millivolts.

Gain Adjustment: this control is used to vary the gain of the AC amplification system, and allows the operator to obtain optimum performance from the servo loop. If the gain is set too low, the instrument may become insensitive to small signal changes; if gain is set too high, recording instability or pen-motor oscillations will usually result.

Damping Adjustment: this control varies the feedback voltage obtained from the velocity coil on the pen-motor amature. It is adjusted for a desired response characteristic. For maximum effectiveness, damping should be set with an impedance across the input terminals approximately equal to the expected signal source impedance.

Calibration Control: this serves to regulate the amount of reference supply voltage applied across the servo potentiometer. Its setting determines the recorder's full-span calibration.

Specifications

Frequency Response: 100 per cent of full scale input with 0-1 MV calibration

Accuracy: ½ per cent of full scale on any range

Chart speed: accurate to line frequency, i.e. .05 per cent error

Zero adjustment: full span

Optional range extenders: voltage dividers available which allow selection of spans and zero adjustment

Span Adjustment: includes built-in venier control to provide degree of span setability required

Range Selector Switch: available with 1, 5, 10, 50, 100 and 500 MV; or with 1, 5, 10, 50 and 100 V

Chart: 6 inches wide; 103 feet long; $4\frac{1}{2}$ inches active width

APPENDIX E

CRITERIA USED IN MEASURING THE PAUSE CONTROLLING FOR WORD RECOGNITION

CRITERIA USED IN MEASURING THE PAUSE CONTROLLING FOR WORD RECOGNITION

1. If the child repeats an entire syntactic constituent, i,e. "in the yard...in the yard", count the repetition as an extra syntactic constituent read.

2. If the child inserts a word within a syntactic constituent, count it as part of that syntactic constituent.

3. If a word is omitted in a syntactic constituent or more than one word, retain the syntactic constituent and count the pauses within as usual.

4. If the child repeats twice, i.e. "her...his...her", then there are two pauses and two lengths of time.

5. If a child omits an entire syntactic constituent, subtract this from the total number of syntactic constituents read.

6. If there is only one word in a syntactic constituent, and the child pauses between the syllables of this word for a significant length of time, count this as a pause within a syntactic constituent.

7. If the child repeats syllables within a word, i.e. "pre...pre...pre...prepare", count the pauses as pauses within syntactic constituents, provided that the repetition was not due to lack of word recognition, as indicated by the Word Recognition Test.

8. If there is a pause, prior to a prompt (as indicated in the Gilmore Oral Reading Test Manual), then do not count the entire length of this pause, but only the length of a significant pause for that child. However, count the pause itself as one pause.

9. If there is a pause prior to a word which was missed or caused hesitation on the Word Recognition Test, treat this pause the same as that in number 8 - that is, count the pause as one pause, but count the length only as the length of a significant pause for that child, and do not measure the entire length of time spent in pausing.

10. If the child inserts an irrelevant word or words, i.e. "oh", or "I don't know that", count only one pause and measure the interval taken to pronounce the word or words as the interval of significant pause for that child.

APPENDIX F

TECHNICAL SPECIFICATIONS
UHER - 4000

TECHNICAL SPECIFICATIONS
UHER - 4000

Tape speed: 7½ ips (high fidelity recordings)

Frequency Response: 40 - 20,000 c.p.s. at 7½ ips

Signal to Noise Ratio: 55 db

Tone Control: VU meter (set to peak at 0 db ± 2.5 for each recording

Modulation Control: kept constant for each recording

Tape: reel, 5", 1½ mills in weight, width 6.25± 0.05 millimeters

Loudspeaker-Earphones Socket: used to connect diod resistor netword and Esterline Angus Speedservo Iabgraph equipment

APPENDIX G

THREE-WAY ANALYSIS OF VARIANCE GROUPING ACCORDING TO SILENT READING GROUP, GRADE AND SEX

TABLE G.1

THREE-WAY ANALYSIS OF VARIANCE GROUPING ACCORDING TO SILENT READING GROUP, GRADE AND SEX

1.Variable: Ratio of Total Time Pausing to Total Time Reading, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	728.28	2	364.19	8.28	0.0006	Sig.
B	51.68	1	51.68	1.17	0.2824	N.S.
AB	295.02	2	147.51	3.35	0.0415	Sig
C	0.69	1	0.69	1.58	0.9003	N.S.
BC	70.01	1	70.01	1.59	0.2117	N.S.
AC	110.05	2	55.02	1.25	0.2932	N.S.
ABC	114.52	2	57.26	1.30	0.2792	N.S.
Errors	2636.50	60	43.94			

2.Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	647.38	2	323.69	7.34	0.0014	Sig.
B	56.88	1	56.88	1.29	0.2604	N.S.
AB	291.44	2	145.72	3.30	0.0434	Sig.
C	1.00	1	1.00	2.26	0.8807	N.S.
BC	5.33	1	53.38	1.21	0.2755	N.S.
AC	12.35	2	61.75	1.40	0.2543	N.S.
ABC	107.44	2	53.72	1.21	0.3028	N.S.
Errors	2645.00	60	44.08			

3.Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	4202.16	2	2101.08	14.35	0.00001	Sig.
B	1050.35	1	1050.35	7.17	0.0095	Sig.
AB	624.36	2	312.18	2.13	0.1273	N.S.
C	9.00	1	9.00	6.15	0.8049	N.S.
BC	245.68	1	245.68	1.67	0.2000	N.S.
AC	161.16	2	80.58	0.55	0.5794	N.S.
ABC	48.02	2	24.01	0.16	0.8490	N.S.
Errors	8780.44	60	146.34			

TABLE G.1 (continued)

4.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	33.50	2	16.75	1.59	0.2107	N.S.
B	1.68	1	1.68	0.16	0.6902	N.S.
AB	21.02	2	10.51	1.00	0.3727	N.S.
C	0.00	1	0.00	0.00	1.0000	N.S.
BC	25.68	1	25.68	2.45	0.1227	N.S.
AC	26.16	2	13.08	1.24	0.2943	N.S.
ABC	50.19	2	25.09	2.39	0.0998	N.S.
Errors	628.85	60	10.48			

5.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. Out Criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	20.22	2	10.11	0.92	0.4002	N.S.
B	3.12	1	3.12	0.28	0.5939	N.S.
AB	16.00	2	8.00	0.73	0.4834	N.S.
C	0.25	1	0.25	2.29	0.8800	N.S.
BC	13.34	1	13.34	1.22	0.2736	N.S.
AC	20.66	2	10.33	0.95	0.3924	N.S.
ABC	40.77	2	20.38	1.87	0.1622	N.S.
Errors	652.52	60	10.87			

6.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	607.05	2	303.52	6.45	0.0028	Sig.
B	630.12	1	630.12	13.39	0.0005	Sig.
AB	114.33	2	57.16	1.21	0.3037	N.S.
C	5.44	1	5.44	0.11	0.7348	N.S.
BC	115.01	1	115.01	2.44	0.1231	N.S.
AC	71.05	2	35.52	0.75	0.4742	N.S.
ABC	41.44	2	20.72	0.44	0.6457	N.S.
Errors	2821.87	60	47.03			

TABLE G.1 (continued)

7.Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1654.06	2	827.02	6.83	0.0021	Sig.
B	896.05	1	896.05	7.40	0.0085	Sig.
AB	247.52	2	123.76	1.02	0.3659	N.S.
C	26.69	1	26.69	0.22	0.6403	N.S.
BC	206.72	1	206.72	1.70	0.1962	N.S.
AC	119.38	2	59.69	0.49	0.6131	N.S.
ABC	103.52	2	51.76	0.42	0.6540	N.S.
Errors	7263.69	60	121.06			

8.Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1070.17	2	535.08	4.81	0.0114	Sig.
B	1042.72	1	1042.72	9.38	0.0032	Sig.
AB	255.86	2	127.93	1.15	0.3229	N.S.
C	21.77	1	21.77	0.19	0.6594	N.S.
BC	122.72	1	122.72	1.10	0.2973	N.S.
AC	105.05	2	52.52	0.47	0.6254	N.S.
ABC	148.36	2	74.18	0.66	0.5165	N.S.
Errors	6663.31	60	111.05			

9.Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1654.06	2	827.02	6.83	0.0021	Sig.
B	896.05	1	896.05	7.40	0.0085	Sig.
AB	247.52	2	123.76	1.02	0.3659	N.S.
C	26.69	1	26.69	0.22	0.6403	N.S.
BC	206.72	1	206.72	1.70	0.1962	N.S.
AC	119.38	2	59.69	0.49	0.6131	N.S.
ABC	103.52	2	51.76	0.42	0.6540	N.S.
Errors	7263.69	60	121.06			

TABLE G.1 (continued)

10. Variable: Average length of pause Within Syntactic Constituents, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	306741.00	2	153371.00	14.38	0.00001	Sig.
B	83708.60	1	83708.60	7.85	0.0068	Sig.
AB	27433.00	2	13716.50	1.28	0.2836	N.S.
C	2669.44	1	2669.44	0.25	0.6185	N.S.
BC	59455.00	1	59455.00	5.57	0.0214	Sig.
AC	192.88	2	96.44	0.00	0.9909	N.S.
ABC	2614.53	2	1307.26	0.12	0.8847	N.S.
Errors	639508.60	60	10658 .50			

11. Variable: Average length of pause Within Syntactic Constituents, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	526523.00	2	263261.00	17.81	0.00000	Sig.
B	157360.00	1	157360.00	10.64	0.0018	Sig.
AB	12939.20	2	6469.62	0.43	0.6475	N.S.
C	3383.36	1	3383.36	0.22	0.6340	N.S.
BC	112338.00	1	112338.00	7.60	0.0077	Sig.
AC	282.88	2	141.44	0.00	0.9904	N.S.
ABC	3754.08	2	1877.04	0.12	0.8809	N.S.
Errors	886821.00	60	14780.30			

12. Variable: Average length of pause Within Syntactic Constituents, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1602900.00	2	801448.00	2.76	0.0707	N.S.
B	2443890.00	1	2443890.00	8.44	0.0051	Sig.
AB	478162.00	2	239081.00	0.82	0.4427	N.S.
C	35344.00	1	35344.00	0.12	0.7279	N.S.
BC	77158.90	1	77158.90	0.26	0.6075	N.S.
AC	8458.16	2	4229.08	0.01	0.9855	N.S.
ABC	624270.00	2	312135.00	1.07	0.3466	N.S.
Errors	17368200.00	60	289469.00			

TABLE G.1 (continued)

13. Variable: Ratio of Total Time Pausing to Total Time Reading, using control for word recognition, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	683.55	2	341.77	7.14	0.0016	Sig.
B	2.34	1	2.34	0.04	0.8254	N.S.
AB	66.77	2	33.38	0.69	0.5015	N.S.
C	121.00	1	121.00	2.52	0.1169	N.S.
BC	369.01	1	369.01	7.71	0.0073	Sig.
AC	60.66	2	30.33	0.63	0.5339	N.S.
ABC	24.77	2	12.38	0.25	0.7726	N.S.
Errors	2870.19	60	47.83			

14. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. Out criterion, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1284.50	2	642.25	0.81	0.4490	N.S.
B	264.50	1	264.50	0.33	0.5653	N.S.
AB	581.08	2	290.54	0.36	0.6942	N.S.
C	641.77	1	641.77	0.81	0.3714	N.S.
BC	133.38	1	133.38	0.16	0.6828	N.S.
AC	195.72	2	97.86	0.12	0.8839	N.S.
ABC	1340.36	2	670.18	0.84	0.4338	N.S.
Errors	47486.70	60	791.44			

15. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. In criterion, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	3023.72	2	1511.86	17.74	0.00000	Sig.
B	276.12	1	276.12	3.24	0.0768	N.S.
AB	67.00	2	33.50	0.39	0.6765	N.S.
C	266.77	1	266.77	3.13	0.0818	N.S.
BC	666.12	1	666.12	7.82	0.0069	Sig.
AC	47.72	2	23.86	0.28	0.7566	N.S.
ABC	82.33	2	41.16	0.48	0.6191	N.S.
Errors	5110.63	60	85.17			

TABLE G.1 (continued)

16.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using control for word recognition, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	119.38	2	59.69	5.22	0.0080	Sig.
B	53.38	1	53.38	4.67	0.0345	Sig.
AB	3.36	2	1.68	0.14	0.8634	N.S.
C	8.02	1	8.02	0.70	0.4050	N.S.
BC	46.72	1	46.72	4.09	0.0475	Sig.
AC	1.72	2	0.86	0.07	0.9274	N.S.
ABC	2.52	2	1.26	0.11	0.8953	N.S.
Errors	685.02	60	11.41			

17.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. Out criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	91.72	2	45.86	4.18	0.0199	Sig.
B	48.34	1	48.34	4.40	0.0400	Sig.
AB	3.36	2	1.68	0.15	0.8582	N.S.
C	6.25	1	6.25	0.56	0.4533	N.S.
BC	42.01	1	42.01	3.82	0.0550	N.S.
AC	1.16	2	0.58	0.05	0.9482	N.S.
ABC	3.69	2	1.84	0.16	0.8454	N.S.
Errors	658.18	60	10.96			

18.Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S	D.F.	M.S.	F-Ratio	Probability	Decision
A	899.38	2	449.69	12.80	0.00002	Sig.
B	18.00	1	18.00	0.51	0.4767	N.S.
AB	96.58	2	48.29	1.37	0.2606	N.S.
C	90.25	1	90.25	2.57	0.1141	N.S.
BC	180.50	1	180.50	5.14	0.0269	Sig.
AC	36.50	2	18.50	0.51	0.5973	N.S.
ABC	39.58	2	19.79	0.56	0.5721	N.S.
Errors	2106.70	60	35.11			

TABLE G.1 (continued)

19.Variable: Number of Pauses Within Syntactic Constituents, using control for word recognition, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	524.66	2	262.33	4.23	0.0190	Sig.
B	276.12	1	276.12	4.45	0.0389	Sig.
AB	106.58	2	53.29	0.86	0.4282	N.S.
C	64.00	1	64.00	1.03	0.3135	N.S.
BC	74.01	1	74.01	1.19	0.2787	N.S.
AC	4.66	2	2.33	0.03	0.9630	N.S.
ABC	25.86	2	12.93	0.20	0.8122	N.S.
Errors	3716.87	60	61.94			

20.Variable: Number of Pauses Within Syntactic Constituents, using W.R. Out criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	204.16	2	102.08	2.42	0.0971	N.S.
B	120.12	1	120.12	2.85	0.0964	N.S.
AB	81.08	2	40.54	0.96	0.3876	N.S.
C	53.77	1	53.77	1.27	0.2629	N.S.
BC	110.01	1	110.01	2.61	0.1112	N.S.
AC	2.38	2	1.19	0.02	0.9720	N.S.
ABC	2.02	2	1.01	0.02	0.9762	N.S.
Errors	2526.54	60	42.10			

21.Variable: Number of Pauses Within Syntactic Constituents, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S	D.F.	M.S.	F-Ratio	Probability	Decision
A	524.66	2	262.33	4.23	0.0190	Sig.
B	276.12	1	276.12	4.45	0.0389	Sig.
AB	106.58	2	53.29	0.86	0.4282	N.S.
C	64.00	1	64.00	1.03	0.3135	N.S.
BC	74.01	1	74.01	1.19	0.2787	N.S.
AC	4.66	2	2.33	0.03	0.9630	N.S.
ABC	25.86	2	12.93	0.20	0.8122	N.S.
Errors	3716.87	60	61.94			

TABLE G.1 (continued)

22.Variable: Average length of pause Within Syntactic Constituents, using control for word recognition, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	386918.00	2	193459.00	16.13	0.00000	Sig.
B	110607.00	1	110607.00	9.22	0.0035	Sig.
AB	4863.44	2	2431.72	0.20	0.8169	N.S.
C	1806.25	1	65160.50	0.15	0.6992	N.S.
BC	65160.50	1	1046.33	5.43	0.0231	Sig.
AC	2092.67	2	274.50	0.08	0.9165	N.S.
ABC	549.00	2	11989.70	0.02	0.9773	N.S.
Errors	719383.00	60				

23.Variable: Average length of pause Within Syntactic Constituents, using W.R. Out criterion, on first Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A						
A	599300.00	2	299650.00	18.14	0.00000	Sig.
B	140715.00	1	140715.00	8.52	0.0049	Sig.
AB	2795.25	2	1397.62	0.08	0.9189	N.S.
C	981.77	1	981.77	0.05	0.8082	N.S.
BC	70249.90	1	70249.90	4.25	0.0435	Sig.
AC	3437.06	2	1718.53	0.10	0.9013	N.S.
ABC	396.86	2	198.43	0.01	0.9880	N.S.
Errors	990833.00	60	16513.90			

24.Variable: Average length of pause Within Syntactic Constituents, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	11995900.00	2	5997950.00	0.67	0.5122	N.S.
B	9791780.00	1	9791780.00	1.10	0.2975	N.S.
AB	23622800.00	2	11811400.00	1.33	0.2716	N.S.
C	6351230.00	1	6351230.00	0.71	0.4007	N.S.
BC	10463800.00	1	10463800.00	1.18	0.2816	N.S.
AC	1137640.00	2	568820.00	0.06	0.9379	N.S.
ABC	5001380.00	2	2500690.00	0.28	0.7552	N.S.
Errors	531999000.00	60	8866650.00			

TABLE G.1 (continued)

25. Variable: Oral Reading Comprehension Scores

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	124.38	2	62.19	0.23	0.7945	N.S.
B	117.55	1	117.55	0.43	0.5114	N.S.
AB	747.86	2	373.93	1.38	0.2575	N.S.
C	113.77	1	113.77	0.42	0.5182	N.S.
BC	288.00	1	288.00	1.06	0.3053	N.S.
AC	492.72	2	246.36	0.91	0.4063	N.S.
ABC	900.25	2	450.12	1.67	0.1967	N.S.
Errors	16166.70	60	269.44			

26. Variable: Auditory Memory Span for Digits Forward

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	0.38	2	0.19	0.17	0.8398	N.S.
B	2.00	1	2.00	1.79	0.1847	N.S.
AB	4.00	2	2.00	1.79	0.1741	N.S.
C	3.36	1	3.36	3.02	0.8712	N.S.
BC	5.55	1	5.55	4.99	0.0290	Sig.
AC	0.05	2	0.02	0.02	0.9753	N.S.
ABC	0.11	2	0.05	0.04	0.9512	N.S.
Errors	66.66	60	1.11			

27. Variable: Auditory Memory Span for Digits Backward

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	3.38	2	1.69	2.71	0.0746	N.S.
B	1.12	1	1.12	1.79	0.1847	N.S.
AB	2.33	2	1.16	1.86	0.1635	N.S.
C	0.25	1	0.25	0.39	0.5295	N.S.
AB	0.12	1	0.12	0.19	0.6563	N.S.
AC	0.50	2	0.25	0.39	0.6721	N.S.
ABC	1.33	2	0.66	1.06	0.3506	N.S.
Errors	37.50	60	0.62			

TABLE G.1 (continued)

28. Variable: Visual Letter Span for Letters

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	2.66	2	1.33	2.98	0.0583	N.S.
B	0.34	1	0.34	0.77	0.3817	N.S.
AB	0.02	2	0.01	0.03	0.9694	N.S.
C	0.44	1	0.44	0.99	0.3228	N.S.
AB	0.01	1	0.01	0.03	0.8607	N.S.
AC	0.22	2	0.11	0.24	0.7808	N.S.
ABC	0.19	2	0.09	0.21	0.8052	N.S.
Errors	26.83	60	0.44			

29. Variable: Intelligence Quotient

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1181.06	2	590.52	7.84	0.0009	Sig.
B	20.05	1	20.05	0.26	0.6076	N.S.
AB	159.52	2	79.76	1.05	0.3529	N.S.
C	3.36	1	3.36	0.04	0.8333	N.S.
AB	50.00	1	50.00	0.66	0.4182	N.S.
AC	132.72	2	66.36	0.88	0.4194	N.S.
ABC	462.58	2	231.29	3.07	0.0536	N.S.
Errors	4516.50	60	75.27			

APPENDIX H

TABLES OF MEANS AND INTERACTION GRAPHS

BY

SILENT READING GROUP, GRADE, AND SEX

TABLE AND FIGURE H.1

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	28.0	33.2	30.6
	Average	27.0	32.7	29.8
	Below-Average	30.7	32.5	31.6
3	Above-Average	29.2	25.5	27.3
	Average	31.7	31.3	31.5
	Below-Average	35.8	40.7	38.3

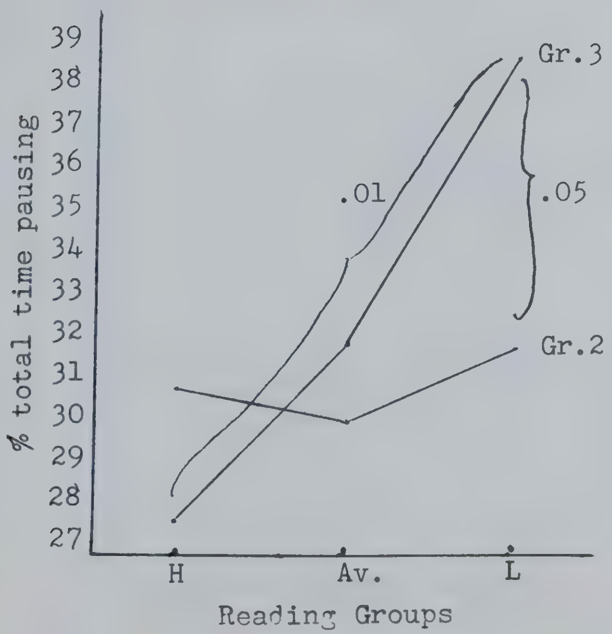
Significant Sources of Variance:

Group	p = .0006
Group-Grade Interation	p = .04

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	n.s.
L			–

AB INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.3 H – Gr.3 L $p < .01$
Gr.3 L – Gr.2 L $p < .05$

All other Interactions were N.S. when Scheffé Test applied

TABLE AND FIGURE H.2

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING,
USING WORD RECOGNITION OUT CRITERION,
ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	28.0	32.2	30.1
	Average	26.2	31.5	28.8
	Below-Average	29.7	31.5	30.6
3	Above-Average	28.7	24.8	26.8
	Average	31.2	30.8	31.0
	Below-Average	34.5	39.7	37.1

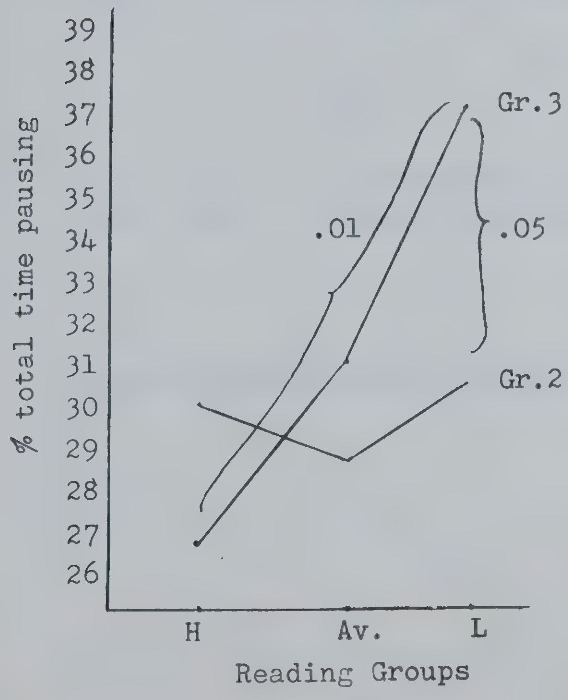
Significant Sources of Variance:

Group	p = .001
Group-Grade Interaction	p = .04

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.05
Av.		–	n.s.
L			–

AB INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.3 H - Gr.3 L		$p < .01$
Gr.3 L - Gr.2 L		$p < .05$

All other Interations were N.S. when Scheffé Test applied

TABLE H.3

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	33.2	46.7	39.9
	Average	45.7	46.5	46.1
	Below-Average	50.3	65.8	58.1
3	Above-Average	32.2	26.7	29.4
	Average	42.3	40.2	41.3
	Below-Average	53.5	58.2	55.8

Significant Sources of Variance:

Group	$p = .00001$
Grade	$p = .01$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	.05	.01
Av.		–	.01
L			–

There were no Interaction Effects on this Variable

TABLE AND FIGURE H.4

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING CONTROL FOR WORD RECOGNITION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	28.8	31.8	30.3
	Average	27.2	32.0	29.6
	Below-Average	32.7	37.5	35.1
3	Above-Average	26.5	24.5	25.5
	Average	34.2	26.8	30.5
	Below-Average	37.0	35.3	36.2

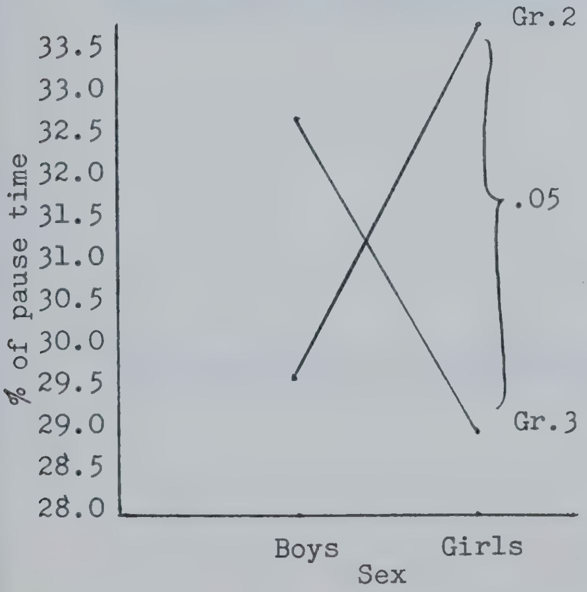
Significant Sources of Variance:

Group	p = .001
Grade-Sex Interaction	p = .01

Scheffé Test of Significance Between Groups

	H	Av.	L
H	-	n.s.	.01
Av.		-	.01
L			-

BC INTERACTION GRAPH



Significant Results of Scheffe Tests of Interaction:

Gr.2G–Gr.3G $p < .05$

All other Interactions were N.S. when Scheffé Test applied

TABLE H.5

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING W.R. OUT CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	28.5	31.8	30.2
	Average	27.2	31.7	29.4
	Below-Average	32.0	37.0	34.5
3	Above-Average	26.5	24.5	25.5
	Average	34.0	26.8	30.4
	Below-Average	35.7	34.8	35.3

Significant Sources of Variance:

None

There were no significant differences between the reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURE H.6

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING W.R. IN CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	29.7	34.8	32.3
	Average	33.8	37.2	35.5
	Below-Average	43.8	55.5	49.7
3	Above-Average	26.8	24.5	25.7
	Average	36.3	28.5	32.4
	Below-Average	50.7	44.5	47.6

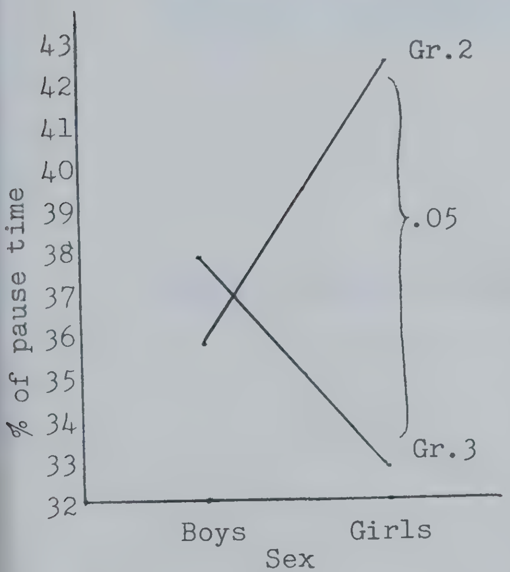
Significant Sources of Variance:

Group	p = .000001
Grade-Sex Interaction	p = .01

Scheffe´ Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffe´ Tests of Interaction:

Gr.2G–Gr.3G $p < .05$

All other Interactions were N.S. when Scheffe´ Test applied

TABLE H.7

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	9.8	14.2	12.0
	Average	10.2	12.7	11.4
	Below-Average	11.8	12.2	12.0
3	Above-Average	11.2	9.2	10.2
	Average	12.0	11.8	11.9
	Below-Average	11.3	13.5	12.4

Significant Sources of Variance:

None

There were no significant differences between the reading groups, nor an Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE H.8

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	9.8	13.5	11.7
	Average	10.2	12.2	11.2
	Below-Average	11.3	11.3	11.3
3	Above-Average	10.7	9.2	9.9
	Average	11.5	11.3	11.4
	Below-Average	10.5	12.7	11.6

Significant Sources of Variance:

None

There were no significant differences between the means of the reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE H.9

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS
TO TOTAL READING TIME, USING W.R.
IN CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	12.7	23.7	18.2
	Average	22.3	20.0	21.2
	Below-Average	22.7	32.3	27.5
3	Above-Average	13.0	10.7	11.8
	Average	19.8	16.7	18.3
	Below-Average	20.2	23.3	21.8

Significant Sources of Variance:

Group	$p = .002$
Grade	$p = .01$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	.05	.01
Av.		–	.05
L			–

There were no Interaction Effects on this Variable.

TABLE AND FIGURE H.10

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING CONTROL FOR WORD RECOGNITION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	4.7	8.5	6.6
	Average	6.8	8.8	7.8
	Below-Average	11.3	12.3	11.8
3	Above-Average	5.3	5.0	5.2
	Average	7.0	5.8	6.4
	Below-Average	10.3	8.8	9.6

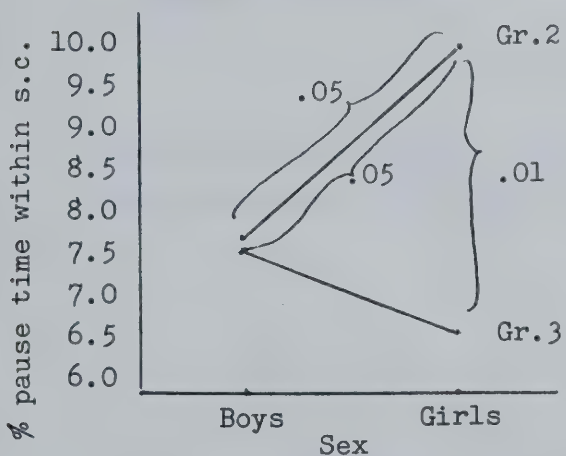
Significant Sources of Variance:

Group	$p = .008$
Grade	$p = .03$
Grade-Sex Interaction	$p = .04$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2B–Gr.2G $p < .05$
Gr.3B–Gr.2G $p < .05$
Gr.2G–Gr.3G $p < .01$

All other Interactions were N.S. when Scheffé Test applied

TABLE H.11

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W.R. OUT CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	4.7	8.3	6.5
	Average	6.7	8.8	7.8
	Below-Average	10.8	11.7	11.3
3	Above-Average	5.3	5.0	5.2
	Average	7.0	5.8	6.4
	Below-Average	9.5	8.5	9.0

Significant Sources of Variance:

Group	p = .01
Grade	p = .04

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

There were no Interaction Effects on this Variable.

TABLE AND FIGURE H.12

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W.R. IN CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	5.2	7.0	6.1
	Average	9.3	10.2	9.8
	Below-Average	17.0	20.8	18.9
3	Above-Average	5.3	5.0	5.2
	Average	8.3	6.7	7.5
	Below-Average	17.3	12.7	15.0

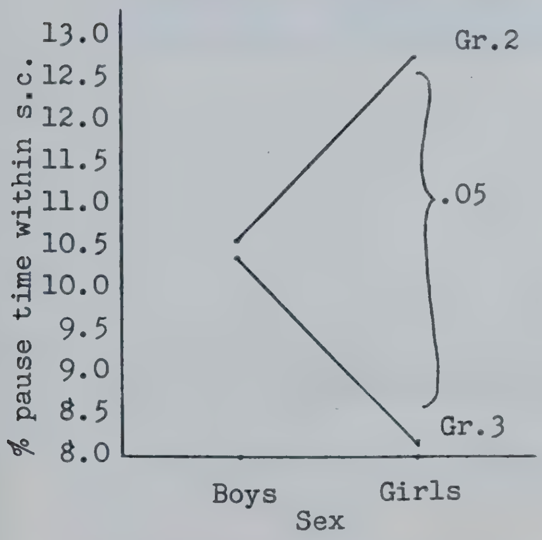
Significant Sources of Variance:

Group	p = .00002
Grade-Sex Interaction	p = .02

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2G–Gr.3G $p < .05$

All other Interactions were N.S. when Scheffé Test applied

TABLE H. 13

RATIO: NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS TO NUMBER OF OPPORTUNITIES TO PAUSE WITHIN, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Silent Reading Groups	Boys	Girls	Total
2	Above-Average	26.0	31.2	28.6
	Average	38.2	38.0	38.1
	Below-Average	47.0	57.2	52.1
3	Above-Average	26.8	20.2	23.5
	Average	34.5	34.0	34.3
	Below-Average	38.8	40.8	39.8

Significant Sources of Variance:

Group	p = .002
Grade	p = .01

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	.01	.01
Av.		–	.01
L			–

There were no Interaction Effects on this Variable.

TABLE H.14

RATIO: NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS TO NUMBER OF OPPORTUNITIES TO PAUSE WITHIN, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	25.2	29.8	27.5
	Average	38.3	35.2	36.8
	Below-Average	42.8	52.3	47.6
3	Above-Average	25.2	19.0	22.1
	Average	32.5	32.0	32.3
	Below-Average	33.7	35.7	34.7

Significant Sources of Variance:

Group	p = .01
Grade	p = .01

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	.01	.01
Av.		–	n.s.
L			–

There were no Interaction Effects on this Variable

TABLE H.15

RATIO: NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS TO NUMBER OF OPPORTUNITIES TO PAUSE WITHIN, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	26.0	31.2	28.6
	Average	38.2	38.0	38.1
	Below-Average	47.0	57.2	52.1
3	Above-Average	26.8	20.2	23.5
	Average	34.5	34.0	34.3
	Below-Average	38.8	40.8	39.8

Significant Sources of Variance:

Group	$p = .002$
Grade	$p = .01$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	-	.01	.01
Av.		-	.01
L			-

There were no Interaction Effects on this Variable

TABLE H.16

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING CONTROL FOR WORD RECOGNITION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	13.2	16.5	14.8
	Average	19.0	20.3	19.7
	Below-Average	28.0	31.5	29.8
3	Above-Average	14.3	12.3	13.3
	Average	19.7	17.3	18.5
	Below-Average	24.5	20.8	22.7

Significant Sources of Variance:

Group	$p = .01$
Grade	$p = .03$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

There were no Interaction Effects on this Variable

TABLE H.17

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING W.R. OUT CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	12.8	16.2	14.5
	Average	18.0	19.8	18.9
	Below-Average	23.2	25.5	24.3
3	Above-Average	14.3	12.3	13.3
	Average	19.0	16.8	17.9
	Below-Average	20.3	17.2	18.8

Significant Sources of Variance:

None

There were no significant differences between the reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE H. 18

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING W.R. IN CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	13.2	16.5	14.8
	Average	19.0	20.3	19.7
	Below-Average	28.0	31.5	29.8
3	Above-Average	14.3	12.3	13.3
	Average	19.7	17.3	18.5
	Below-Average	24.5	20.8	22.7

Significant Sources of Variance:

Group	$p = .01$
Grade	$p = .03$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	-	n.s.	.01
Av.		-	.01
L			-

There were no Interaction Effects on this Variable

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS,
USING CONTROL FOR WORD RECOGNITION,
ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	260.3	383.2	321.8
	Average	302.5	375.5	339.0
	Below-Average	394.0	491.3	442.7
3	Above-Average	236.7	213.0	224.8
	Average	251.8	236.8	244.3
	Below-Average	436.2	423.2	429.7

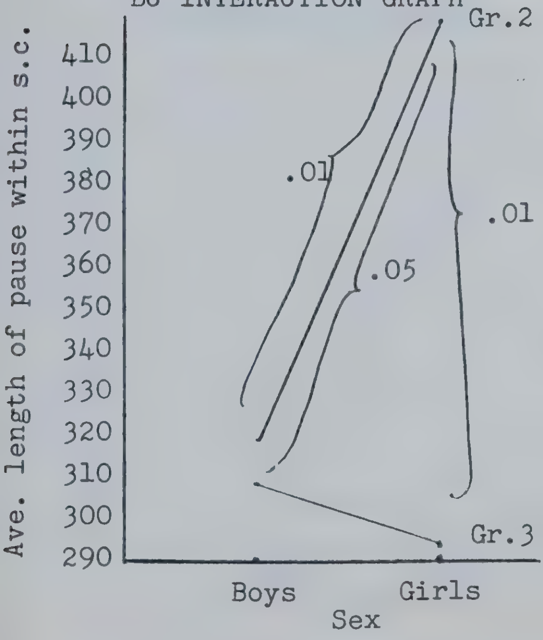
Significant Sources of Variance:

Group	p = .00001
Grade	p = .01
Grade-Sex Interaction	p = .02

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2B-Gr.2G $p < .01$
Gr.3B-Gr.2G $p < .05$
Gr.2G-Gr.3G $p < .01$

All other Interactions were N.S. when Scheffé Test applied.

TABLE AND FIGURE H.20

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	275.5	427.7	351.6
	Average	332.3	432.7	382.5
	Below-Average	483.7	647.0	565.3
3	Above-Average	252.8	225.7	239.3
	Average	278.3	261.5	269.9
	Below-Average	516.8	502.7	509.8

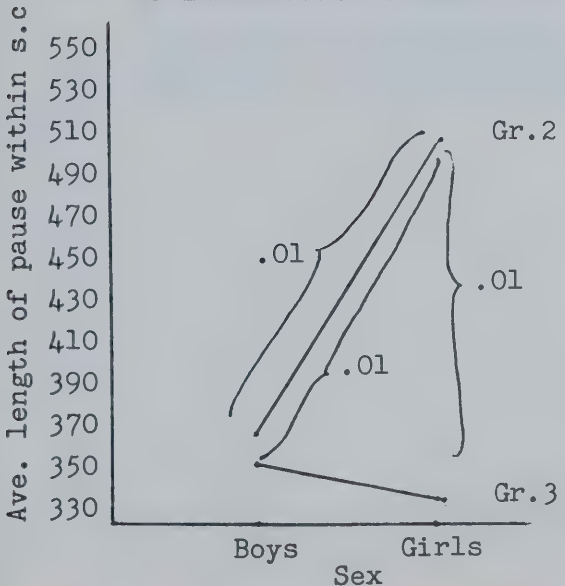
Significant Sources of Variance:

Group	p = .000001
Grade	p = .01
Grade-Sex Interaction	p = .01

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2B-Gr.2G $p < .01$
Gr.3B-Gr.2G $p < .01$
Gr.2B-Gr.2G p .01

All other Interactions were N.S. when Scheffé Test applied

TABLE H.21

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	331.0	703.8	517.4
	Average	668.8	599.2	634.0
	Below-Average	752.2	1339.3	1045.8
3	Above-Average	284.3	242.2	263.3
	Average	459.3	353.3	406.3
	Below-Average	784.8	745.0	764.9

Significant Sources of Variance:

Grade $p = .01$

There were no significant differences between the reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURE H.22

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS, USING CONTROL FOR WORD RECOGNITION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	174.0	309.8	242.1
	Average	254.3	326.8	290.6
	Below-Average	405.0	515.2	460.1
3	Above-Average	168.2	169.7	168.9
	Average	207.3	172.5	189.9
	Below-Average	403.2	394.0	398.6

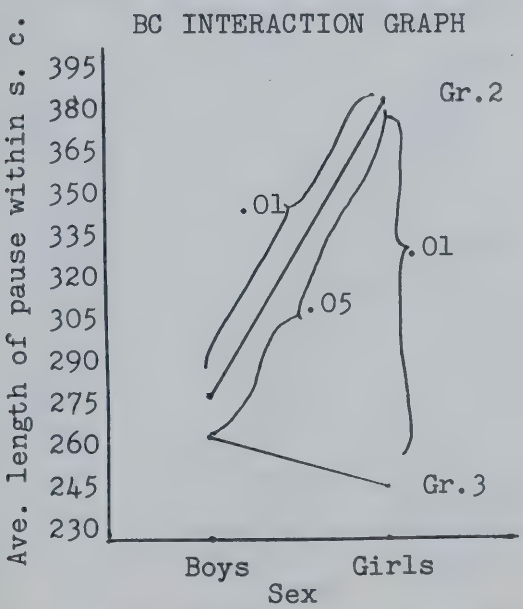
Significant Sources of Variance:

Group	$p = .000001$
Grade	$p = .01$
Grade-Sex Interaction	$p = .02$

Scheffé Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2B–Gr.2G $p < .01$
Gr.3B–Gr.2G $p < .05$
Gr.2G–Gr.3G $p < .01$

All other Interactions were N.S. when Scheffé Test applied

TABLE AND FIGURE H.23

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS, USING W.R. OUT CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	176.7	314.5	245.6
	Average	263.0	338.0	300.3
	Below-Average	472.3	602.7	537.5
3	Above-Average	168.2	169.7	168.9
	Average	213.7	175.7	194.7
	Below-Average	452.0	457.2	454.6

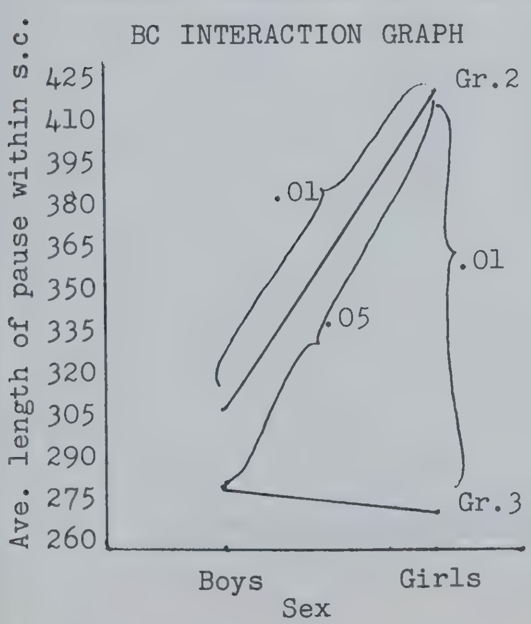
Significant Sources of Variance:

Group	$p = .000001$
Grade	$p = .01$
Grade-Sex Interaction	$p = .04$

Scheffe´ Test of Significance Between Groups

	H	Av.	L
H	–	n.s.	.01
Av.		–	.01
L			–

BC INTERACTION GRAPH



Significant Results of Scheffe´ Tests of Interaction:

Gr.2B–Gr.2G $p < .01$
Gr.3B–Gr.2B $p < .05$
Gr.2G–Gr.3G $p < .01$

TABLE H.24

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENTS, USING W.R. IN CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-Average	184.7	373.3	279.0
	Average	337.5	389.5	363.5
	Below-Average	595.7	899.5	747.6
3	Above-Average	168.2	169.7	168.9
	Average	261.0	192.8	226.9
	Below-Average	690.5	552.2	621.3

Significant Source of Variance:

None

There were no significant differences between the reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffe Tests were indicated.

TABLE H.25

PERCENTAGE OF CORRECT RESPONSES BY SILENT READING GROUPS ON WORD RECOGNITION TEST

Grade	Silent Reading Group	Boys	Girls	Total
2	Above-average	95.8	93.7	94.8
	Average	89.3	90.5	89.9
	Below-average	82.8	75.7	79.3
3	Above-average	97.2	96.0	96.6
	Average	93.3	94.3	93.8
	Below-average	85.0	86.5	85.8

APPENDIX I

CORRELATION COEFFICIENTS

1. TOTAL GROUP
2. GRADE TWO
3. GRADE THREE

TABLE I.1

CORRELATION COEFFICIENTS FOR THE TOTAL GROUP

		1	2
1.	Silent Reading Comprehension	1.000	0.107
2.	Oral Reading Comprehension		1.000
3.	Ratio: Total pause Time to Total Reading Time - entire test		
4.	Ratio: Pausing time within s.c. to Total Reading Time - entire test		
5.	Ratio: Number pauses within s.c. to Number of Opportunties - entire test		
6.	Average length of pause within s.c. - entire test		
7.	Ratio: Total Pause Time to Total Reading Time - 1st three paragraphs		
8.	Ratio: Pausing time within s.c. to Total Reading Time - 1st three paragraphs		
9.	Number of pauses within s.c. - 1st three paragraphs		
10.	Average length of pause within s.c. - 1st three paragraphs		
11.	Digit Span Forward		
12.	Digit Span Backward		
13.	Visual Letter Span		
14.	Intelligence		

TABLE I.1 (continued)

	3	4	5	6	7	8
1.	-0.342**	-0.134	-0.547**	-0.499**	-0.421**	-0.452**
2.	0.225	-0.012	-0.122	0.110	0.160	0.007
3.	1.00	0.725**	0.377**	0.500**	0.636**	0.458**
4.		1.000	0.469**	0.509**	0.459**	0.482**
5.			1.000	0.427**	0.588**	0.640**
6.				1.000	0.503**	0.637**
7.					1.000	0.779**
8.						1.000

TABLE I.1 (continued)

	9	10	11	12	13	14
1.	-0.475**	-0.569**	-0.030	0.172	0.356**	0.439**
2.	0.044	0.036	-0.084	0.057	-0.019	0.326**
3.	0.408**	0.398**	0.044	-0.065	-0.065	-0.192
4.	0.358**	0.333**	0.124	0.003	0.031	-0.243*
5.	0.800**	0.498**	-0.018	-0.183	-0.208	-0.311**
6.	0.442**	0.864**	0.064	-0.046	-0.099	-0.149
7.	0.619**	0.590**	0.006	-0.220	-0.295**	-0.214
8.	0.746**	0.787**	-0.025	-0.094	-0.288**	-0.257**
9.	1.000	0.504**	-0.030	-0.033	-0.206	-0.210
10.		1.000	0.032	-0.108	-0.204	-0.233*
11.			1.000	0.278**	0.364**	-0.174
12.				1.000	0.229**	0.087
13.					1.000	0.114
14.						1.000

** $p < .01$
* $p < .05$

TABLE I.2

CORRELATION COEFFICIENTS FOR GRADE TWO

	1	2
1. Silent Reading Comprehension	1.00	0.314
2. Oral Reading Comprehension		1.000
3. Ratio: Total Pause Time to Total Reading Time - entire test		
4. Ratio: Pausing time within s.c. to Total Reading Time - entire test		
5. Ratio: Number pauses within s.c. to Number of Opportunities - entire test		
6. Average length of pause within s.c. - entire test		
7. Ratio: Total Pause Time to Total Reading Time - 1st three paragraphs		
8. Ratio: Pausing time within s.c. to Total Reading time - 1st three paragraphs		
9. Number of pauses within s.c. - 1st three paragraphs		
10. Average length of pause within s.c. - 1st three paragraphs		
11. Digit Span Forward		
12. Digit Span Backward		
13. Visual Letter Span		
14. Intelligence		

TABLE I.2 (continued)

	3	4	5	6	7	8
1.	-0.035	0.029	-0.673**	-0.384*	-0.256	-0.437**
2.	0.257	0.151	-0.168	-0.002	-0.007	-0.049
3.	1.000	0.744*	0.431**	0.510**	0.581**	0.539**
4.		1.000	0.326*	0.631**	0.441**	0.520**
5.			1.000	0.457**	0.649**	0.631**
6.				1.000	0.420**	0.628**
7.					1.000	0.815**
8.						1.000

TABLE I.2 (continued)

	9	10	11	12	13	14
1.	-0.496**	-0.534**	0.007	-0.020	0.334*	0.534**
2.	0.048	-0.117	-0.127	-0.013	0.121	0.292
3.	0.573**	0.353*	0.001	-0.133	0.112	-0.003
4.	0.273	0.426**	0.088	-0.107	0.026	-0.115
5.	0.751**	0.571**	0.061	-0.204	-0.190	-0.285
6.	0.443**	0.818**	0.081	0.046	0.137	-0.290
7.	0.607**	0.538**	0.012	-0.226	-0.086	-0.136
8.	0.671**	0.788**	0.089	0.017	-0.048	-0.343*
9.	1.000	0.482**	0.019	0.064	-0.042	-0.175
10.		1.000	0.175	0.050	0.097	-0.409**
11.			1.000	0.321*	0.432**	-0.177
12.				1.000	0.188	-0.167
13.					1.000	0.189
14.						1.000

** $p < .01$
* $p < .05$

TABLE I.3

CORRELATION COEFFICIENTS FOR GRADE THREE

	1	2
1. Silent Reading Comprehension	1.000	-0.054
2. Oral Reading Comprehension		1.000
3. Ratio: Total Pause Time to Total Reading Time - entire test		
4. Ratio: Pausing time within s.c. to Total Reading Time - entire test		
5. Ratio: Number of pauses within s.c. to Number of Opportunities - entire test		
6. Average length of pause within s.c. - entire test		
7. Ratio: Total Pause Time to Total Reading Time - 1st three paragraphs		
8. Ratio: Pausing time within s.c. to Total Reading time - 1st three paragraphs		
9. Number of pauses within s.c. - 1st three paragraphs		
10. Average length of pause within s.c. - 1st three paragraphs		
11. Digit Span Forward		
12. Digit Span Backward		
13. Visual Letter Span		
14. Intelligence		

TABLE I.3 (continued)

	3	4	5	6	7	8
1.	-0.483**	-0.244	-0.515**	-0.664**	-0.552**	-0.529**
2.	0.201	-0.136	-0.035	0.273	0.327*	0.110
3.	1.000	0.725**	0.434**	0.591**	0.691**	0.499**
4.		1.000	0.591**	0.420**	0.465**	0.456**
5.			1.000	0.304	0.538**	0.587**
6.				1.000	0.592**	0.586**
7.					1.000	0.752**
8.						1.000

TABLE I.3 (continued)

	9	10	11	12	13	14
1.	-0.533**	-0.688**	-0.040	0.349*	0.389**	0.348*
2.	0.081	0.258	-0.060	0.102	-0.174	0.364*
3.	0.394**	0.530**	0.046	-0.059	-0.189	-0.311
4.	0.453**	0.254	0.177	0.097	0.043	-0.351*
5.	0.824**	0.326*	-0.029	-0.093	-0.184	-0.381*
6.	0.361*	0.872**	0.143	-0.054	-0.276	-0.038
7.	0.651**	0.662**	0.007	-0.207	-0.478**	-0.290
8.	0.803**	0.736**	-0.101	-0.145	-0.512**	-0.246
9.	1.000	0.452**	-0.019	-0.074	-0.367*	-0.289
10.		1.000	-0.056	-0.193	-0.478**	-0.070
11.			1.000	0.187	0.258	-0.152
12.				1.000	0.237	0.354*
13.					1.000	0.046
14.						1.000

** $p < .01$
* $p < .05$

APPENDIX J

THREE-WAY ANALYSIS OF VARIANCE GROUPING ACCORDING TO ORAL READING GROUP, GRADE AND SEX

TABLE J.1

THREE-WAY ANALYSIS OF VARIANCE GROUPING ACCORDING TO ORAL READING GROUP, GRADE AND SEX

1. Variable: Ratio of Total Time Pausing to Total Time Reading, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	110.05	2	55.02	1.03	0.3619	N.S.
B	67.35	1	67.35	1.26	0.2651	N.S.
AB	67.73	2	32.86	0.61	0.5427	N.S.
C	0.69	1	0.69	0.01	0.9094	N.S.
BC	36.25	1	36.25	0.68	0.4125	N.S.
AC	82.05	2	41.02	0.77	0.4672	N.S.
ABC	20.72	2	10.36	0.19	0.8236	N.S.
Errors	3194.37	60	53.23			

2. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	96.72	2	48.36	0.92	0.4006	N.S.
B	74.05	1	74.05	1.42	0.2377	N.S.
AB	41.30	2	20.65	0.39	0.6743	N.S.
C	1.00	1	1.00	0.01	0.8902	N.S.
BC	22.88	1	22.88	0.43	0.5099	N.S.
AC	88.16	2	44.08	0.84	0.4339	N.S.
ABC	13.76	2	6.88	0.13	0.8764	N.S.
Errors	3124.62	60	52.07			

3. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	702.00	2	351.00	1.58	0.2124	N.S.
B	1298.11	1	1298.11	5.87	0.0183	Sig.
AB	334.24	2	167.12	0.75	0.4735	N.S.
C	9.00	1	9.00	0.04	0.8406	N.S.
BC	124.75	1	124.75	0.56	0.4551	N.S.
AC	53.99	2	27.00	0.12	0.8851	N.S.
ABC	93.26	2	46.63	0.21	0.8101	N.S.
Errors	13246.60	60	220.77			

TABLE J.1 (continued)

4. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using control for word recognition, on entire test.

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	24.00	2	12.00	1.09	0.3412	N.S.
B	0.23	1	0.23	0.02	0.8837	N.S.
AB	13.54	2	6.77	0.61	0.5426	N.S.
C	0.00	1	0.00	0.00	1.0000	N.S.
BC	18.96	1	18.96	1.72	0.1934	N.S.
AC	0.66	2	0.33	0.03	0.9700	N.S.
ABC	11.71	2	5.85	0.53	0.5889	N.S.
Errors	657.80	60	10.96			

5. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. Out criterion, on entire test.

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	32.05	2	16.02	1.50	0.2312	N.S.
B	0.81	1	0.81	0.07	0.7831	N.S.
AB	22.27	2	11.13	1.04	0.3588	N.S.
C	0.25	1	0.25	0.02	0.8789	N.S.
BC	8.84	1	8.84	0.82	0.3664	N.S.
AC	1.50	2	0.75	0.07	0.9322	N.S.
ABC	11.74	2	5.87	0.54	0.5798	N.S.
Errors	640.93	60	10.68			

6. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. In criterion, on entire test.

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	3.72	2	1.86	0.02	0.9706	N.S.
B	784.45	1	784.45	12.58	0.0007	Sig.
AB	1.25	2	0.62	0.01	0.9899	N.S.
C	5.44	1	5.44	0.08	0.7686	N.S.
BC	97.78	1	97.78	1.56	0.2152	N.S.
AC	77.72	2	38.86	0.62	0.5395	N.S.
ABC	23.60	2	11.80	0.18	0.8279	N.S.
Errors	3740.38	60	62.33			

TABLE J.1 (continued)

7. Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	197.05	2	98.52	0.49	0.6102	N.S.
B	782.97	1	782.97	3.95	0.0512	N.S.
AB	177.89	2	88.94	0.44	0.6400	N.S.
C	26.69	1	26.69	0.13	0.7147	N.S.
BC	271.88	1	271.88	1.37	0.2457	N.S.
AC	130.72	2	65.36	0.33	0.7200	N.S.
ABC	393.49	2	196.74	0.99	0.3760	N.S.
Errors	11872.90	60	197.88			

8. Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	270.50	2	135.25	0.81	0.4459	N.S.
B	935.75	1	935.75	5.66	0.0205	Sig.
AB	293.10	2	146.55	0.88	0.4172	N.S.
C	21.77	1	21.77	0.13	0.7178	N.S.
BC	184.65	1	184.65	1.11	0.2946	N.S.
AC	62.05	2	31.02	0.18	0.8292	N.S.
ABC	196.06	2	98.03	0.59	0.5557	N.S.
Errors	9914.44	60	165.24			

9. Variable: Ratio - Number of Pauses Within Syntactic Constituents to Number of Opportunities to Pause Within, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	197.05	2	98.52	0.49	0.6102	N.S.
B	782.97	1	782.97	3.95	0.0512	N.S.
AB	177.89	2	88.94	0.44	0.6400	N.S.
C	26.69	1	26.69	0.13	0.7147	N.S.
BC	271.88	1	271.88	1.37	0.2457	N.S.
AC	130.72	2	65.36	0.33	0.7200	N.S.
ABC	393.49	2	196.74	0.99	0.3760	N.S.
Errors	11872.90	60	197.88			

TABLE J.1 (continued)

10. Variable: Average length of pause Within Syntactic Constituents, using control for word recognition, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	136914.00	2	68457.10	4.80	0.0116	Sig.
B	74165.00	1	74165.00	5.20	0.0261	Sig.
AB	144401.00	2	72200.70	5.06	0.0092	Sig.
C	2669.44	1	2669.44	0.18	0.6668	N.S.
BC	53347.30	1	53347.30	3.74	0.0578	N.S.
AC	14431.00	2	7215.52	0.50	0.6054	N.S.
ABC	5481.53	2	2740.76	0.19	0.8256	N.S.
Errors	855663.00	60	14261.00			

11. Variable: Average Length of pause Within Syntactic Constituents, using W.R. Out criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	187239.00	2	93619.30	3.87	0.0262	Sig.
B	147162.00	1	147162.00	6.08	0.0164	Sig.
AB	237486.00	2	118743.00	4.91	0.0105	Sig.
C	3383.36	1	3383.36	0.31	0.7096	N.S.
BC	107855.00	1	107855.00	4.46	0.0388	Sig.
AC	21715.70	2	10857.90	0.44	0.6403	N.S.
ABC	9985.77	2	4992.89	0.20	0.8140	N.S.
Errors	1450660.00	60	24177.70			

12. Variable: Average length of pause Within Syntactic Constituents, using W.R. In criterion, on entire test

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	553024.00	2	276512.00	0.98	0.3799	N.S.
B	3374360.00	1	3374360.00	12.00	0.0009	Sig.
AB	106108.00	2	53054.00	0.18	0.8285	N.S.
C	35344.00	1	35344.00	0.12	0.7241	N.S.
BC	11463.00	1	134323.00	0.04	0.8406	N.S.
AC	268646.00	2	445483.00	0.47	0.6225	N.S.
ABC	890966.00	2	281138.00	1.58	0.2135	N.S.
Errors	16868300.00	60				

TABLE J.1 (continued)

13. Variable: Ratio of Total Time Pausing to Total Time Reading, using control for word recognition, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	225.05	2	112.52	1.92	0.1552	N.S.
B	2.06	1	2.06	0.03	0.8517	N.S.
AB	179.19	2	89.59	1.53	0.2247	N.S.
C	121.00	1	121.00	2.06	0.1557	N.S.
BC	322.33	1	322.33	5.50	0.0222	Sig.
AC	15.16	2	7.58	0.12	0.8787	N.S.
ABC	83.61	2	41.80	0.71	0.4937	N.S.
Errors	3512.81	60	58.54			

14. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. Out criterion, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	2262.17	2	1131.08	1.42	0.2483	N.S.
B	178.07	1	178.07	0.22	0.6373	N.S.
AB	1104.85	2	552.42	0.69	0.5024	N.S.
C	641.77	1	641.77	0.80	0.3720	N.S.
BC	167.93	1	167.93	0.21	0.6471	N.S.
AC	689.38	2	344.69	0.43	0.6496	N.S.
ABC	1218.22	2	609.11	0.76	0.4685	N.S.
Errors	47600.60	60	793.34			

15. Variable: Ratio of Total Time Pausing to Total Time Reading, using W.R. In criterion, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	1130.72	2	565.36	3.92	0.0249	Sig.
B	395.60	1	395.60	2.74	0.1025	N.S.
AB	1139.87	2	569.93	3.96	0.0242	Sig.
C	266.77	1	266.77	1.85	0.1784	N.S.
BC	716.01	1	716.01	4.97	0.0294	Sig.
AC	104.38	2	52.19	0.36	0.6972	N.S.
ABC	298.30	2	149.15	1.03	0.3609	N.S.
Errors	8633.75	60	143.89			

TABLE J.1 (continued)

16. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using control for word recognition, on first 70 syntactic constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	32.88	2	16.44	1.08	0.3456	N.S.
B	47.57	1	47.57	3.12	0.0828	N.S.
AB	37.06	2	18.53	1.21	0.3028	N.S.
C	8.02	1	8.02	0.52	0.4703	N.S.
BC	38.46	1	38.46	2.52	0.1170	N.S.
AC	28.22	2	14.11	0.92	0.4010	N.S.
ABC	32.78	2	16.39	1.07	0.3468	N.S.
Errors	912.53	60	15.20			

17. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. Out Criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	26.72	2	13.36	0.95	0.3892	N.S.
B	40.46	1	40.46	2.90	0.0935	N.S.
AB	25.42	2	12.71	0.91	0.4071	N.S.
C	6.25	1	6.25	0.44	0.5056	N.S.
BC	32.78	1	32.78	2.35	0.1303	N.S.
AC	26.16	2	13.08	0.93	0.3967	N.S.
ABC	24.05	2	12.02	0.86	0.4270	N.S
Errors	836.24	60	13.93			

18. Variable: Ratio of Time Spent Pausing Within Syntactic Constituents to Total Reading Time, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	332.05	2	166.02	3.31	0.0429	Sig.
B	28.72	1	28.72	0.57	0.4515	N.S.
AB	157.17	2	78.58	1.57	0.2163	N.S.
C	90.25	1	90.25	1.80	0.1843	N.S.
BC	140.08	1	140.08	2.79	0.0995	N.S.
AC	2.16	2	1.08	0.02	0.9785	N.S.
ABC	11.29	2	5.64	0.11	0.8934	N.S.
Errors	3002.23	60	50.03			

TABLE J.1 (continued)

19. Variable: Number of Pauses Within Syntactic Constituents, using control for word recognition, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	26.00	2	13.00	0.15	0.8605	N.S.
B	306.08	1	306.08	3.54	0.0645	N.S.
AB	2.25	2	1.12	0.01	0.9870	N.S.
C	64.00	1	64.00	0.74	0.3927	N.S.
BC	46.79	1	46.79	0.54	0.4644	N.S.
AC	88.66	2	44.33	0.51	0.6010	N.S.
ABC	106.85	2	53.42	0.61	0.5420	N.S.
Errors	5180.73	60	86.34			

20. Variable: Number of Pauses Within Syntactic Constituents, using W.R. Out criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	10.16	2	5.08	0.09	0.9086	N.S.
B	90.51	1	90.51	1.70	0.1962	N.S.
AB	5.30	2	2.65	0.05	0.9511	N.S.
C	53.77	1	53.77	1.01	0.3177	N.S.
BC	72.65	1	72.65	1.37	0.2462	N.S.
AC	55.05	2	27.52	0.51	0.5974	N.S.
ABC	33.60	2	16.80	0.31	0.7294	N.S.
Errors	3179.19	60	52.98			

21. Variable: Number of Pauses Within Syntactic Constituents, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	26.00	2	13.00	0.15	0.8605	N.S.
B	306.08	1	306.08	3.54	0.0645	N.S.
AB	2.25	2	1.12	0.01	0.9870	N.S.
C	64.00	1	64.00	0.74	0.3927	N.S.
BC	46.79	1	46.79	0.54	0.4644	N.S.
AC	88.66	2	44.33	0.51	0.6010	N.S.
ABC	106.85	2	53.42	0.61	0.5420	N.S.
Errors	5180.73	60	86.34			

TABLE J.1 (continued)

22. Variable: Average length of pause Within Syntactic Constituents, using control for word recognition, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	204152.00	2	102076.00	5.28	0.0077	Sig.
B	104536.00	1	104536.00	5.41	0.0234	Sig.
AB	218949.00	2	109475.00	5.66	0.0055	Sig.
C	1806.25	1	1806.25	0.09	0.7608	N.S.
BC	66243.60	1	66243.60	3.42	0.0689	N.S.
AC	11813.10	2	5906.57	0.30	0.7377	N.S.
ABC	3151.08	2	1575.54	0.08	0.9217	N.S.
Errors	1159070.00	60	19317.80			

23. Variable: Average length of pause Within Syntactic Constituents, using W.R. Out criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	285204.00	2	142602.00	4.84	0.0112	Sig.
B	55909.20	1	143882.00	4.88	0.0309	Sig.
AB	250539.00	2	178303.00	6.05	0.0040	Sig.
C	9088.44	1	981.77	0.03	0.8557	N.S.
B	64349.30	1	80118.70	2.72	0.1042	N.S.
AC	26569.50	2	7220.77	0.24	0.7833	N.S.
ABC	14056.10	2	4607.32	0.15	0.8555	N.S.
Errors	1666590.00	60	29449.50			

24. Variable: Average length of pause Within Syntactic Constituents, using W.R. In criterion, on first 70 Syntactic Constituents only

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	7923570.00	2	3961780.00	0.44	0.6443	N.S.
B	5289820.00	1	5289820.00	0.59	0.4449	N.S.
AB	9654390.00	2	4827190.00	0.53	0.5858	N.S.
C	6351230.00	1	6351230.00	0.70	0.4028	N.S.
BC	7401430.00	1	7401430.00	0.82	0.3667	N.S.
AC	4702640.00	2	2351320.00	0.26	0.7698	N.S.
ABC	411760.00	2	205880.00	0.02	0.9772	N.S.
Errors	536898000.00	60	8948300.00			

TABLE J.1 (continued)

25. Variable: Silent Reading Comprehension Scores

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	459.72	2	229.86	2.18	0.1216	N.S.
B	78.00	1	78.00	0.74	0.3920	N.S.
AB	664.10	2	332.05	3.15	0.0499	Sig.
C	4.00	1	4.00	0.03	0.8461	N.S.
BC	5.77	1	5.77	0.05	0.8156	N.S.
AC	162.50	2	81.25	0.77	0.4668	N.S.
ABC	167.17	2	83.58	0.79	0.4569	N.S.
Errors	6319.62	60	105.32			

26. Variable: Auditory Memory Span for Digits Forward

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	0.22	2	0.11	0.10	0.9029	N.S.
B	0.86	1	0.86	0.79	0.3770	N.S.
AB	0.83	2	0.41	0.38	0.6831	N.S.
C	3.36	1	3.36	3.09	0.0837	N.S.
BC	7.16	1	7.16	6.59	0.0127	Sig.
AC	0.88	2	0.44	0.40	0.6662	N.S.
ABC	5.05	2	2.52	2.32	0.1065	N.S.
Errors	65.21	60	1.08			

27. Variable: Auditory Memory Span for Digits Backward

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	0.72	2	0.36	0.56	0.5724	N.S.
B	0.40	1	0.40	0.62	0.4323	N.S.
AB	0.62	2	0.31	0.48	0.6180	N.S.
C	0.25	1	0.25	0.38	0.5347	N.S.
BC	0.11	1	0.11	0.18	0.6711	N.S.
AC	1.16	2	0.58	0.90	0.4081	N.S.
ABC	3.41	2	1.70	2.65	0.0782	N.S.
Errors	38.48	60	0.64			

TABLE J.1 (continued)

28. Variable: Visual Memory Span for Letters

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	3.50	2	0.75	4.01	0.0231	Sig.
B	0.10	1	0.10	0.23	0.6276	N.S.
AB	2.10	2	1.05	2.41	0.0981	N.S.
C	0.44	1	0.44	1.01	0.3166	N.S.
BC	0.02	1	0.02	0.05	0.8143	N.S.
AC	1.05	2	0.52	1.21	0.3051	N.S.
ABC	0.46	2	0.23	0.53	0.5890	N.S.
Errors	26.15	60	0.43			

29. Variable: Intelligence Quotient

Source	S.S.	D.F.	M.S.	F-Ratio	Probability	Decision
A	712.38	2	356.19	3.12	0.0513	N.S.
B	16.74	1	16.74	0.14	0.7030	N.S.
AB	89.76	2	44.88	0.39	0.6765	N.S.
C	3.36	1	3.36	0.02	0.8643	N.S.
BC	90.71	1	90.71	0.79	0.3761	N.S.
AC	68.05	2	34.02	0.129	0.7432	N.S.
ABC	20.18	2	10.09	0.08	0.9154	N.S.
Errors	6846.31	60	114.10			

APPENDIX K

TABLES OF MEANS AND INTERACTION GRAPHS

BY

ORAL READING GROUP, GRADE, AND SEX

TABLE K.1

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	27.3	34.8	32.3
	Second Group	31.4	32.1	31.8
	Third Group	27.6	29.0	27.9
3	First Group	33.0	36.7	34.8
	Second Group	30.7	31.5	31.1
	Third Group	33.0	29.3	31.2

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.2

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING,
USING WORD RECOGNITION OUT CRITERION,
ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	27.0	34.0	31.7
	Second Group	30.6	30.9	30.8
	Third Group	26.9	27.7	27.1
3	First Group	31.8	36.0	33.9
	Second Group	30.5	30.8	30.7
	Third Group	32.0	28.5	30.3

Significant Sources of Varance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.3

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING WORD RECOGNITION IN CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	39.5	50.8	47.0
	Second Group	50.0	55.3	53.1
	Third Group	40.8	53.7	44.0
3	First Group	50.2	46.2	48.2
	Second Group	38.2	37.2	37.7
	Third Group	39.7	41.7	40.7

Significant Source of Variance:

Grade $p = .01$

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURE K.4

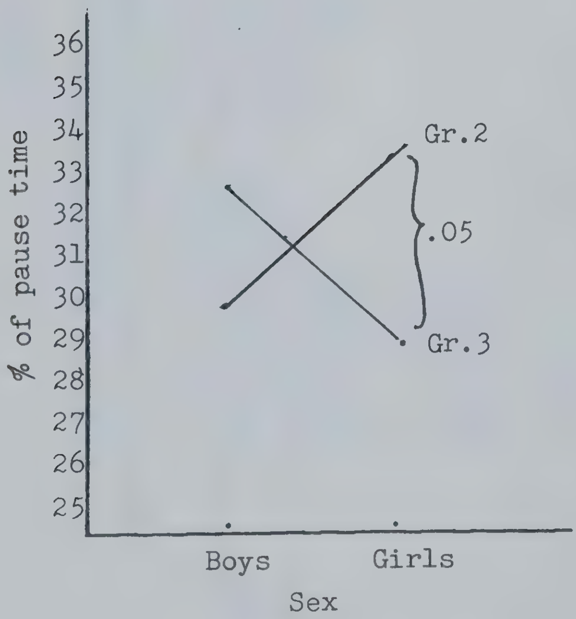
RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING CONTROL FOR WORD RECOGNITION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	30.8	34.9	33.5
	Second Group	32.8	32.7	32.7
	Third Group	27.2	33.3	28.8
3	First Group	35.7	32.8	34.3
	Second Group	30.5	27.8	29.2
	Third Group	31.5	26.0	28.8

Significant Source of Variance:

Grade-Sex Interaction $p = .02$

BC INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.3 G - Gr.2 G $p < .05$

All other Interactions were N.S. when Scheffé Test applied.

TABLE K.5

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING,
USING W. R. OUT CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	30.8	34.8	33.4
	Second Group	32.4	32.4	32.4
	Third Group	26.8	32.7	28.3
3	First Group	34.5	32.7	33.6
	Second Group	30.5	27.7	29.1
	Third Group	31.2	25.8	28.5

Significant Sources of Variance:
None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURES K.6

RATIO OF TOTAL TIME PAUSING TO TOTAL TIME READING, USING W.R. IN CRITERION,ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade		Boys	Girls	Total
2	First Group	33.3	39.8	37.6
	Second Group	42.2	42.7	42.5
	Third Group	33.3	49.3	37.3
3	First Group	47.8	38.3	43.1
	Second Group	31.0	29.8	30.4
	Third Group	35.0	29.3	32.2

Significant Sources of Variance:

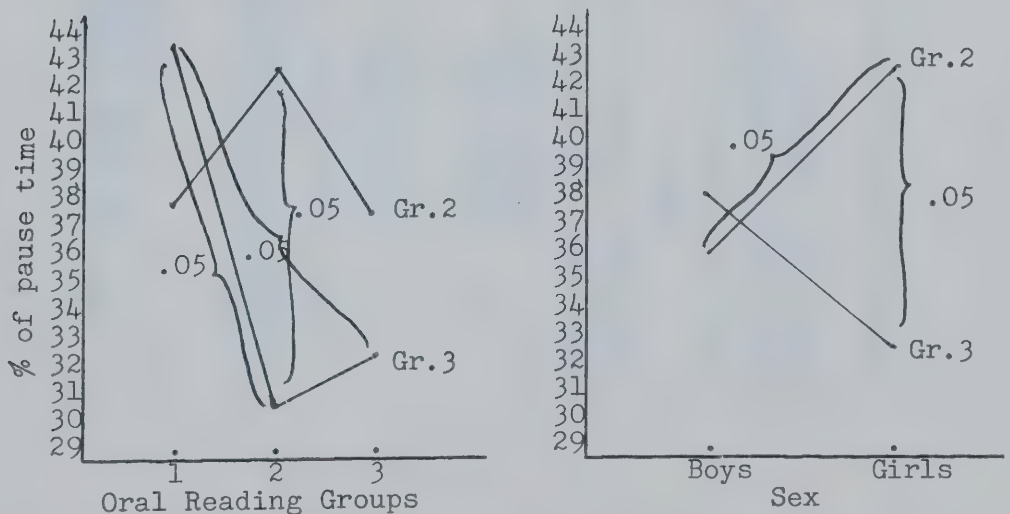
Groups	p = .02
Group-Grade Interaction	p = .02
Grade-Sex Interaction	p - .02

Scheffé Test of Significant Differences Between Groups

	1	2	3
1	-	n.s.	n.s.
2		-	n.s.
3			-

AB INTERACTION

BC INTERACTION



Significant Results of Scheffé Tests of Interaction:

Gr.2:2nd - Gr.3: 2nd $p < .05$
Gr.3:1st - Gr.3: 3rd $p < .05$
Gr.3:1st - Gr.3: 2nd $p < .05$

Gr.2 B - Gr.2 G $p < .05$
Gr.2 G - Gr.3 G $p < .05$

TABLE K.7

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	6.3	14.3	12.7
	Second Group	11.6	12.1	11.9
	Third Group	11.7	11.7	11.7
3	First Group	10.3	10.7	10.5
	Second Group	13.2	12.5	12.8
	Third Group	11.7	11.3	11.5

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.8

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	9.5	13.9	12.4
	Second Group	11.2	11.1	11.2
	Third Group	10.4	11.0	10.6
3	First Group	9.7	10.3	10.0
	Second Group	12.2	12.3	12.3
	Third Group	10.8	10.5	10.7

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.9

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	17.3	23.6	21.5
	Second Group	22.6	25.6	24.3
	Third Group	18.2	29.3	21.0
3	First Group	19.5	15.3	17.4
	Second Group	18.2	17.0	17.6
	Third Group	15.3	18.3	16.8

Significant Source of Variance:

Grade $p = .0007$

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.10

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING CONTROL FOR WORD RECOGNITION ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	6.5	10.3	9.0
	Second Group	9.4	9.7	9.6
	Third Group	7.1	9.7	7.8
3	First Group	8.7	7.8	8.3
	Second Group	5.3	6.5	5.9
	Third Group	8.5	5.3	6.9

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.11

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W. R. OUT CRITERION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	6.5	10.1	8.9
	Second Group	8.8	9.4	9.2
	Third Group	7.0	8.7	7.4
3	First Group	8.3	7.7	8.0
	Second Group	5.3	6.5	5.9
	Third Group	8.2	5.2	6.7

Significant Sources of Variance:
None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.12

RATIO OF TIME SPENT PAUSING WITHIN SYNTACTIC CONSTITUENTS TO TOTAL READING TIME, USING W. R. IN CRITERION, ON FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	6.8	11.6	10.0
	Second Group	14.4	11.4	12.7
	Third Group	10.0	20.7	12.7
3	First Group	10.8	9.8	10.3
	Second Group	5.3	7.0	6.2
	Third Group	10.0	7.0	8.5

Significant Source of Variance:
Groups $p = .04$

Scheffé Test of Significance Between Groups

	1	2	3
1	–	n.s.	n.s.
2		–	n.s.
3			–

The Scheffé Test could not indicate where the significant differences between the means of the three groups were.

TABLE K.13

RATIO: NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS TO TOTAL NUMBER OF OPPORTUNITIES TO PAUSE WITHIN USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	30.8	44.1	39.7
	Second Group	32.7	38.6	38.8
	Third Group	38.7	45.0	40.3
3	First Group	34.2	27.8	31.0
	Second Group	34.3	37.3	35.8
	Third Group	31.7	29.8	30.8

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.14

RATIO: NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS TO TOTAL NUMBER OF OPPORTUNITIES TO PAUSE WITHIN, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	30.5	40.6	37.3
	Second Group	36.0	35.9	35.9
	Third Group	37.3	42.7	38.7
3	First Group	30.8	25.7	28.3
	Second Group	33.0	34.0	33.5
	Third Group	27.5	27.0	27.3

Significant Source of Variance:

Grade $p = .02$

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.15

RATIO: NUMBER OF PAUSES MADE WITHIN SYNTACTIC CONSTITUENTS TO TOTAL NUMBER OF OPPORTUNITIES TO PAUSE WITHIN, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	30.8	44.1	39.7
	Second Group	32.7	38.6	38.8
	Third Group	38.7	45.0	40.3
3	First Group	34.2	27.8	31.0
	Second Group	34.3	37.3	35.8
	Third Group	31.7	29.8	30.8

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.16

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING CONTROL FOR WORD RECOGNITION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	18.0	23.3	21.5
	Second Group	23.0	22.1	22.5
	Third Group	22.2	23.0	22.4
3	First Group	20.5	18.2	19.3
	Second Group	17.3	18.3	17.8
	Third Group	20.7	14.0	17.3

Significant Sources of Variance:
None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K. 17

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING
W. R. OUT CRITERION, ON THE FIRST 70
SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	17.8	22.5	20.9
	Second Group	19.2	19.4	19.3
	Third Group	17.4	17.7	17.5
3	First Group	17.8	16.3	17.1
	Second Group	17.0	17.0	17.0
	Third Group	18.8	13.0	15.9

Significant Sources of Variance:

None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE K.18

NUMBER OF PAUSES WITHIN SYNTACTIC CONSTITUENTS, USING W. R. IN CRITERION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	18.0	23.3	21.5
	Second Group	23.0	22.1	22.5
	Third Group	22.2	23.0	22.4
3	First Group	20.5	18.2	19.3
	Second Group	17.3	18.3	17.8
	Third Group	20.7	14.0	17.3

Significant Sources of Variance:
None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURE K.19

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING CONTROL FOR WORD RECOGNITION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	289.5	376.0	347.2
	Second Group	351.8	472.7	422.3
	Third Group	313.8	394.3	333.9
3	First Group	422.2	348.3	385.3
	Second Group	236.3	248.7	242.5
	Third Group	266.2	276.0	271.1

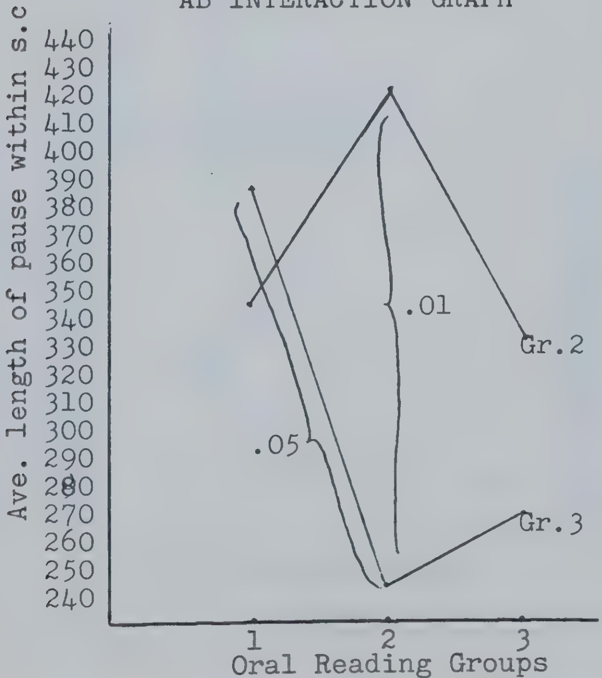
Significant Sources of Variance:

Group	$p = .01$
Grade	$p = .02$
Group-Grade Interaction	$p = .009$

Scheffé Test of Significance Between Groups

	1	2	3
1	–	n.s.	n.s.
2		–	n.s.
3			–

AB INTERACTION GRAPH



Significant Results of Scheffé Tests of Interaction:

Gr.2: 2nd – Gr.3: 2nd $p < .01$
Gr.3: 1st – Gr.3: 2nd $p < .05$

All other Interactions were N.S. when Scheffé Test applied.

TABLE AND FIGURES K.20

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING W.R. OUT CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	309.5	449.3	402.7
	Second Group	425.2	564.4	506.4
	Third Group	353.9	499.7	390.3
3	First Group	482.8	394.8	438.8
	Second Group	257.3	281.7	269.5
	Third Group	307.8	313.3	310.6

Significant Sources of Variance:

Group	$p = .02$
Grade	$p = .01$
Group-Grade Interaction	$p = .01$
Grade-Sex Interaction	$p = .03$

Scheffé Test of Significance Between Groups

	1	2	3
1	–	n.s.	n.s.
2		–	n.s.
3			–

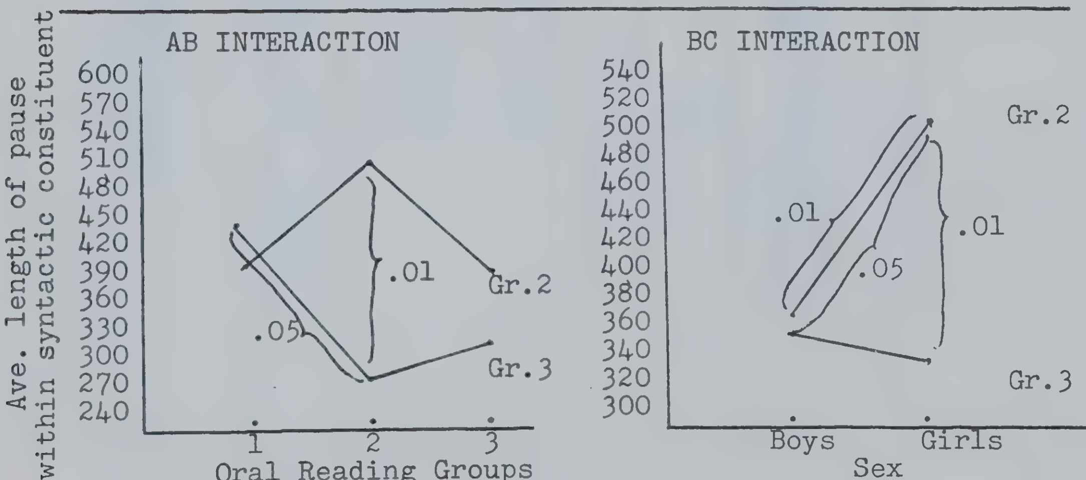


TABLE K.21

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING W.R. IN CRITERION, ON ENTIRE TEST

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	521.5	656.0	611.2
	Second Group	707.4	1066.1	916.7
	Third Group	543.2	1047.7	669.3
3	First Group	790.2	495.2	642.7
	Second Group	349.5	337.5	343.5
	Third Group	388.8	507.8	448.3

Significant Source of Variance:

Grade $p = .0009$

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffé Tests were indicated.

TABLE AND FIGURE K.22

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING CONTROL FOR WORD RECOGNITION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	235.8	223.0	301.6
	Second Group	316.4	382.6	437.3
	Third Group	275.0	391.3	304.1
3	First Group	382.2	321.0	351.6
	Second Group	155.7	182.7	169.2
	Third Group	302.8	232.5	267.7

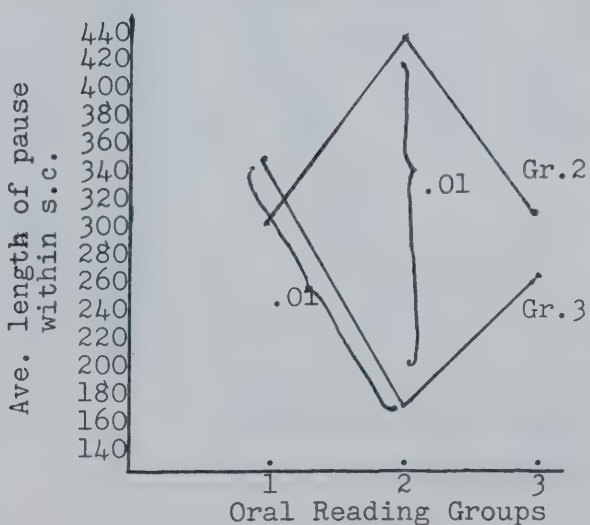
Significant Sources of Variance:

Group	$p = .007$
Grade	$p = .02$
Group-Grade Interaction	$p = .005$

Scheffé Test of Significant Differences Between Groups

	1	2	3
1	–	n.s.	n.s.
2		–	n.s.
3			–

AB INTERACTION



Significant Results of Scheffé Tests of Interaction:

Gr.2: 2nd – Gr.3: 2nd $p < .01$
Gr.3: 1st – Gr.3: 1st $p < .01$

TABLE AND FIGURE K.23

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING W. R. OUT CRITERION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	237.5	348.5	311.5
	Second Group	371.0	480.0	434.6
	Third Group	296.1	461.0	337.3
3	First Group	421.7	359.7	390.7
	Second Group	157.8	193.5	175.7
	Third Group	254.3	249.3	251.8

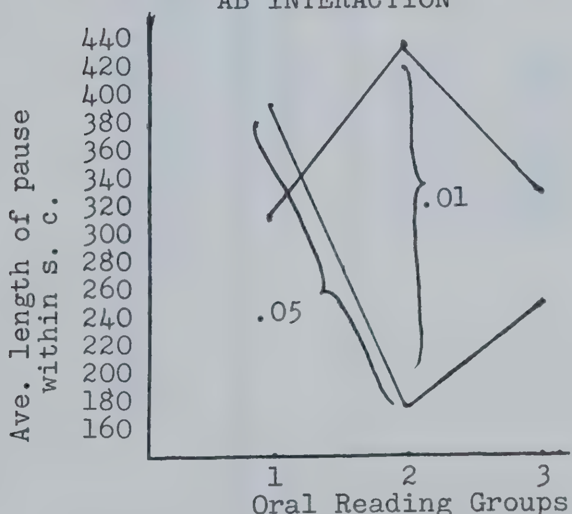
Significant Sources of Variance:

Groups	$p = .01$
Grade	$p = .03$
Group-Grade Interaction	$p = .004$

Scheffé Test of Significant Differences Between Groups

	1	2	3
1	-	n.s.	n.s.
2		-	n.s.
3			-

AB INTERACTION



Significant Results of Scheffé Tests of Interaction:

Gr.2: 2nd - Gr.3: 2nd $p < .01$

Gr.3: 1st - Gr.3: 2nd $p < .05$

TABLE K.24

AVERAGE LENGTH OF PAUSE WITHIN SYNTACTIC CONSTITUENT, USING W. R. IN CRITERION, ON THE FIRST 70 SYNTACTIC CONSTITUENTS

Grade	Oral Reading Group	Boys	Girls	Total
2	First Group	240.3	387.9	338.7
	Second Group	485.6	607.9	556.9
	Third Group	368.7	872.0	494.5
3	First Group	660.3	402.0	531.2
	Second Group	157.3	206.3	181.8
	Third Group	302.0	306.3	304.2

Significant Sources of Variance:

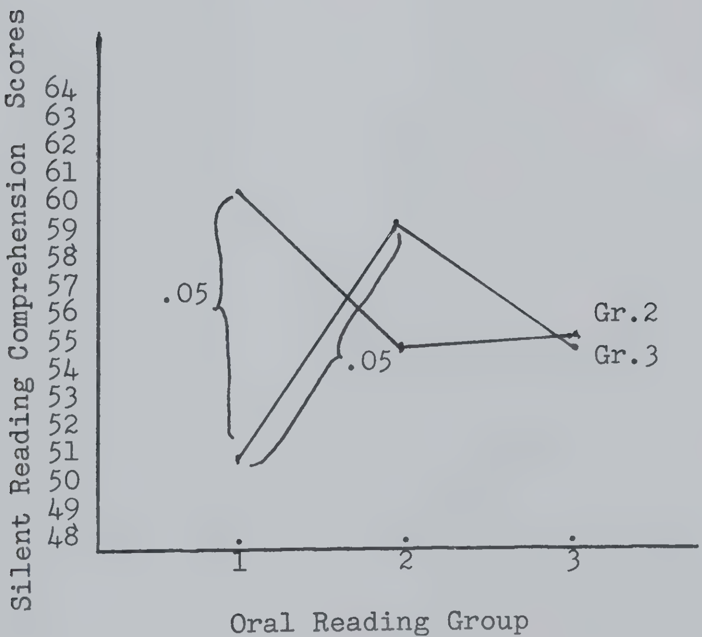
None

There were no significant differences between reading groups, nor any Interaction Effects on this Variable. Therefore, no Scheffe Tests were indicated.

FIGURE K.25

GROUP-GRADE INTERACTION

SILENT READING COMPREHENSION SCORES BY
ORAL READING GROUP



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